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(54) **Apparatus and method for allocating a common channel in a CDMA mobile communication system**

Gerät und Verfahren zum Zuteilen eines gemeinsamen Kanals in einem CDMA Mobilkommunikationssystem

Appareil et procédé d'allocation d'un canal commun dans un système AMRC de communication mobile

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- **"Universal Mobile Telecommunication System (UMTS); UTRAN Iur Interface RNSAP Signalling (3GPP TS 25.423 Version 3.3.0 Release 1999)" ETSI TS 125 423 V3.3.0, September 2000 (2000-09), XP002220187**

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to a method for allocating a common channel in a CDMA (Code Division Multiple Access) mobile communication system, and in particular, to an apparatus and method for allocating a common channel in the case that a serving radio network controller (SRNC) is different from a drift radio network controller (DRNC).

2. Description of the Related Art

[0002] With the rapid development of the mobile communication industry, a future mobile communication system will provide not only a voice (circuit) service but also advanced services such as a data service and an image service. Generally, the future mobile communication system employs a CDMA (Code Division Multiple Access) system. The CDMA system is classified into a synchronous system and an asynchronous system. The synchronous system is chiefly adopted in United States, while the asynchronous system is mainly adopted in Europe and Japan. However, the standardization work on the future mobile communication system is being separately carried out for the synchronous system and the asynchronous system. The European future mobile communication system is called "UMTS (Universal Mobile Telecommunication System)".

[0003] The standardization provides various specifications for the data service and the images service as well as the voice service, required in the future mobile communication system, and particularly, for channel allocation.

[0004] A UMTS W-CDMA (Wideband Code Division Multiple Access) communication system, the European future mobile communication system, uses a random access channel (RACH) and a common packet channel (CPCH) as a reverse common channel, and uses a forward access channel (FACH) as a forward common channel.

[0005] Among the reverse common channels of the W-CDMA communication system, the RACH can have characteristics dependent on a TTI (Transmit Time Interval) and a channel coding mode, and is mapped with a physical random access channel (PRACH) on a one-to-one basis. Further, the PRACH can have characteristics being dependent on available signatures and an access sub-channel. Therefore, the RACHs can be distinguished (identified) based on the TTI and the channel coding mode, while the PRACHs can be distinguished according to the number of available signatures and the access sub-channel. In addition, an available spreading factor (SF) can be also used in distinguishing the PRACHs.

[0006] As the RACHs and PRACHs have various characteristics, they can be used for different purposes according to their service types. In addition, information on the RACH/PRACH is broadcast by a Node B, and upon receiving the RACH/PRACH information, a UE can select which RACH/PRACH to use depending on the received RACH/PRACH information. Alternatively, the Node B can select the RACH/PRACH to be used by a specific UE based on a service to be used by the UE, and then inform the UE of the selected RACH/PRACH.

[0007] Like the RACH, the FACH and the CPCH also have different characteristics to provide different services, so that the UE can select proper FACH and CPCH according to the characteristics of the FACH and CPCH provided from the Node B. Alternatively, the Node B can determine the FACH and the CPCH to be used by the UE and then transmit information on the determined FACH and CPCH to the UE.

[0008] Meanwhile, common channels such as the RACH, the FACH and the CPCH are allocated to the UEs by a serving radio network controller (SRNC). The SRNC connected to a core network (CN) exchanges information on a service provided between the UE and the CN. The SRNC determines a channel to be allocated to the UE using the service information transmitted from the CN.

[0009] Shown in Tables 1A to 1C are RAB (Radio Access Bearer) parameters of a service information message used by the CN to inform the SRNC of the service information.

Table 1A

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAB parameters				
>Traffic Class	M		ENUMERATED (conversational, streaming, interactive, background, ...)	**Desc.**: This IE indicates the type of application for which the Radio Access Bearer service is optimised

Table 1A (continued)

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAB parameters				
>RAB Asymmetry Indicator	M		ENUMERATED (Symmetric bidirectional Asymmetric Uni directional downlink, Asymmetric Uni directional Uplink, Asymmetric Bidirectional, ...)	**Desc.**: This IE indicates asymmetry or symmetry of the RAB and traffic direction

Table 1B

>Delivery Order	M		ENUMERATED (delivery order requested, delivery order not requested)	**Desc:** This IE indicates that whether the RAB shall provide In-sequence SDU delivery or not **Usage:** Delivery order requested: in sequence delivery shall be guaranteed by UTRAN on all RAB SDUs Delivery order net requested: in sequence delivery is not required from UTRAN
>Maximum SDU size	M		INTEGER (0.32768)	**Desc.**: This IE indicates the maximum allowed SDU size The unit is: bit. **Usage:** Conditional value: set to largest RAB Subflow Combination compound SDU size when present among the different RAB Subflow Combination

Table 1B (continued)

>SDU parameters		1 to <maxRABSubflows >	See below	**Desc.:** This IE contains the parameters characterizing the RAB SDUs **Usage** Given per subflow with first occurence corresponding to subflow#1 etc*
>Transfer Delay	C-iftrafficCo nv-Stream		INTEGER (0.. 65535)	**Desc.:** This IE indicates the maximum delay for 95th percentile of the distribution of delay for all delivered SDUs during the lifetime of a RAB, where delay for an SDU Is defined as the time from a request to transfer an SDU at one SAP to its delivery at the other SAP The unit is: millisecond. **Usage:** -

Table 1C

>Traflic Handling priority	C - iftrafficIntera ctiv		INTEGER (spare (0), highest (1), lowest (14), no priority used (15)} (075)	**Desc.:** This IE specifies the relative importance for handling of all SDUs belonging to the radio access bearer compared to the SDUs of other bearers **Usage:** -
>Allocation/Retention priority	O		See below	**Desc.:** This IE specifies the relative importance compared to other Radio access bearers for allocation and retention of the Radio access bearer.

Table 1C (continued)

				Usage: If this IE is not received, the request is regarded as it cannot trigger the preemption process and it is vulnerable to the preemption process.
>Source Statistics descriptor	C-iftrafficCo nv-Stream		ENUMERATED (speech, unknown, ?	**Desc.:** This IE_specifies characteristics of the source of submitted SDUs **Usage:** -

[0010] The SRNC selects a dedicated channel (DCH) or a common channel using the RAB parameters shown in Tables 1A to 1C. If the common channel is selected, the SRNC can select the RACH or the CPCH in response to a service request. In addition, a maximum bit rate and a guaranteed bit rate are used in selecting a minimum SF and a channelization code to be used by the common channel. That is, the SF and the channelization code to be used by the common channel are determined depending on the maximum bit rate and the guaranteed bit rate. Here, the maximum bit rate and the guaranteed bit rate are bit rate information of the packet data.

[0011] In addition, a traffic handling priority and a transfer delay are selected based on the characteristics of the physical channel, i.e., based on the sub-channel and the number of signatures.

[0012] When the UE, with a channel allocated by the SRNC, performs a handover (or handoff), a DRNC, an RNC of a Node B newly accessed by the UE, and the SRNC may be changed. The SRNC and the DRNC are distinguished from the viewpoint of the UE. If the SRNC is connected to the UE not directly, but through the DRNC, then the SRNC cannot personally select a channel and allocate the selected channel to the UE.

[0013] The reasons that the SRNC cannot personally allocate a channel to the UE are as follows.

[0014] First, channels allocated to a cell in the DRNC are determined by the DRNC, because the SRNC does not have information on the allocated common channel in the DRNC. For this reason, the SRNC cannot determine a common channel allocated to the cell in the DRNC. Second, the DRNC or the CN does not have information on a service provided to the UE, so it is difficult to allocate a common channel to be used by the UE. Thus, conventionally, when the SRNC is connected to the UE through the DRNC, i.e., when the UE performs a handover, the UE cannot be allocated a common channel.

ETSI TS 125 423 V3.3.0 is the technical specification describing the UTRAN Iur Interface RNSAP Signalling in UMTS. The common transport channel resources initialization procedure is used by the SRNC for the initialization of the common transport channel user plane towards the DRNC and/or for the initialization of the UE context in the DRNC. Successful operation of the common transport channel resources initialization procedure includes a COMMON TRANSPORT CHANNEL RESOURCES REQUEST from the SRNC to the DRNC, and a COMMON TRANSPORT CHANNEL RESOURCES RESPONSE from the DRNC to the SRNC. The COMMON TRANSPORT CHANNEL RESOURCES REQUEST comprises the following IEs: message type, transaction ID, D-RNTI, C-ID, transport bearer request indicator, and transport bearer ID. D-RNTI is the UE context identifier in the DRNC. The transport bearer ID uniquely identifies an Iur transport bearer. The transport bearer request indicator indicates whether an Iur transport bearer needs to be established for carrying the FACH data stream(s), or whether an existing transport bearer will be used. The FDD message of the COMMON TRANSPORT CHANNEL RESOURCES RESPONSE comprises, inter-alia, FACH and RACH info IEs.

WO 00/44191 A1 discloses a method and apparatus for speeding up the connection setup during handover in advanced cellular networks. A new connection is requested from a destination access network to a remote peer and by a mobile terminal, whereupon a connection setup is initiated by the destination access network by sending a handover request to a serving access network, bundling connection parameters associated with an old connection by the serving access network, transferring the bundled connection parameters to the destination access network, and establishing a new connection to the remote peer connection by the destination access network using the transferred connection param-

eters. The bundled connection parameters may comprise a peak packet rate. AAL2 connection specific information such as data rate is transferred from the S-RNC to the D-RNC at the start of the handover process. The serving and destination access networks may be radio network controllers.

SUMMARY OF THE INVENTION

[0015] It is, therefore, the object of the present invention to provide a method and system in which a serving radio network controller (SRNC) shares service information provided from a core network, so that a drift radio network controller (DRNC) can allocate a common channel to a UE.

[0016] This object is solved by the invention as claimed in the independent claims.

[0017] Preferred embodiments are defined by the dependent claims.

[0018] It is an aspect of the present invention to provide a method in which an SRNC provides a signaling message having service information received from a CN to a DRNC, so that the SRNC and the DRNC exchange information required in allocating a common channel to a specific UE handed over from the SRNC to the DRNC.

[0019] There is provided a method for setting a common channel for a packet data service by an SRNC through a Node B to a UE and a DRNC when the UE is handed over from a first Node B to a second Node B as the UE moves to the second Node B, in a mobile communication system. The mobile communication system includes the UE, the first Node B providing the packet data service to the UE, the SRNC connected to the first Node B, and a CN (Core Network) connected to the SRNC. The CN has bit rate information for the packet data service and transmits the bit rate information to the SRNC. The SRNC stores the bit rate information. The DRNC is connected to the second Node B neighboring the first Node B and also connected to the SRNC. The SRNC transmits service parameters including the bit rate information for the packet data service to the DRNC, and receives information on a common channel determined based on the service parameters from the DRNC. The SRNC transmits information on the determined common channel to the UE through the DRNC and the second Node B, to allocate the determined common channel to the UE.

[0020] Preferably, the bit rate information includes a maximum bit rate and a guaranteed bit rate.

[0021] Preferably, the common channel includes a common packet channel (CPCH), a random access channel (RACH) or a forward access channel (FACH).

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a method for allocating a common channel to a UE in the case where an SRNC is different from a DRNC, according to an embodiment of the present invention;

FIG. 2 illustrates a procedure for transmitting service parameters required for allocating a common channel from the SRNC to the DRNC according to an embodiment of the present invention;

FIG. 3 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to an embodiment of the present invention;

FIG. 4 illustrates a procedure for transmitting the service parameters required for allocating a common channel from the SRNC to the DRNC according to another embodiment of the present invention; and

FIG. 5 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0023] A preferred embodiment of the present invention will be described herein below with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

[0024] The present invention provides two different embodiments for allocating a common channel to a UE in the case where an SRNC to which the UE belongs is different from a DRNC.

[0025] In a first embodiment, the SRNC transmits service information received from a CN to the DRNC. Upon receiving the service information, the DRNC selects a common channel based on the received service information and then allocates the selected common channel to the UE.

[0026] In a second embodiment, the SRNC selects a common channel service information received from the CN and transmits information on the selected common channel to the DRNC. Upon receiving the information on the common channel, the DRNC allocates a common channel to the UE based on the received common channel information.

In the first and second embodiments, the common channel selected by the SRNC may be identical to or different from the common channel selected by the DRNC.

[0027] A description of the first embodiment will be given herein below. As stated above, the service information transmitted from the CN to the SRNC is shown Tables 1A to 1C. In this embodiment, the SRNC should transmit the service information received from the CN to the DRNC. Thus, a definition of a message transmitted from the SRNC to the DRNC will be given.

[0028] The SRNC can transmit the service information received from the CN to the DRNC by including it in a Common Transport Channel Resources Request message. The SRNC transmits some or all of the service information received from the CN to the DRNC, using the Common Transport Channel Resources Request message. Upon receiving the Common Transport Channel Resources Request message, the DRNC detects the service information included in the received Common Transport Channel Resources Request message. The DRNC then allocates a common transport channel or a common physical channel to the UE based on the detected service information. Shown in Table 2 is a format of the Common Transport Channel Resources Request message according to the first embodiment of the present invention.

Table 2

IE/Group Name	Presence	Range	IE type and reference reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.40		YES	Reject
Transaction ID	M		9.2.1.59		YES	Reject
D-RNTI	M		9.2.125		YES	Reject
C-ID	O					
TransportBearer Request Indicator	M		9.2.1.61	Request a new transport bearer or to use an existing bearer for the user plane	YES	Reject
TransportBearer ID	M		9.2.1.60	Indicates the Iur transport bearer to be used for the user plane	YES	Reject
RAB information		0..1				
>Traffic Class	O					
>RAB Asymmetry Indicator	O					
>Maximum Bit Rate	O					
>Guaranteed Bit Rate	O					
>Delivery Order	O					
>Transfer Delay	O					
>Traffic Handling priority	O					
>Allocation/ Retentio n priority	O					
>Priority level	O					

Table 2 (continued)

IE/Group Name	Presence	Range	IE type and reference reference	Semantics description	Criticality	Assigned Criticality
>Pre-emption Capability	O					
>Pre-emption Vulnerability	O					
>Queuing allowed	O					

[0029] Table 2 shows some of the service information received from the CN. Specially, it is noted that in table 2, parameters mentioned following "the RAB information" row, i.e., from *">Traffic Class"* to *">Queuing Allowed"*, can be included in the RAB information and thus, they can be grouped in the RAB information. That is, in selecting service information required for selecting a common channel, the SRNC may select all of the service information received from the CN or partially selects only the necessary information shown in Table 2.

[0030] The service information required by the DRNC in allocating a common channel to the UE includes the following parameters that should be transmitted from the SRNC to the DRNC.

(1) Maximum Bit Rate

[0031] The maximum bit rate represents a requirement for a maximum value of a bit rate of data to be transmitted/received over the common channel. Therefore, upon receiving the maximum bit rate, the DRNC allocates the common channel within a range not exceeding the maximum bit rate. This is because the maximum bit rate can become a criterion for determining a spreading factor (SF) indicating a bit rate for a physical channel. Therefore, the maximum bit rate can become a criterion for selecting a random access channel (RACH) rather than a common packet channel (CPCH), for the SF<32.

(2) Guaranteed Bit Rate

[0032] The guaranteed bit rate represents a requirement for a guaranteed value of a bit rate of data to be transmitted/received over the common channel. Therefore, upon receiving the guaranteed bit rate, the DRNC allocates the common channel within a range capable of guaranteeing the received guaranteed bit rate. For example, if the received guaranteed bit rate requires a spreading factor SF=16, the DRNC allocates the CPCH rather than the RACH. In addition, the DRNC allocates a CPCH set capable of supporting the SF=16 among CPCH sets. Likewise, even in the case of a forward access channel (FACH), the DRNC allocates a secondary common control physical channel (S-CCPCH) capable of supporting the spreading factor SF=16.

[0033] In addition to the maximum bit rate and the guaranteed bit rate, the service information required by the DRNC in allocating a common channel to the UE includes Traffic Class, RAB Asymmetry Indicator, Delivery Order Transfer Delay, Traffic Handling Priority, and Allocation/Retention Priority parameters. These parameters can be used by the DRNC as criterions for selecting a common channel.

[0034] FIG. 1 illustrates a method for allocating a common channel to a UE in the case where an SRNC is different from a DRNC, according to an embodiment of the present invention. Referring to FIG. 1, upon receiving an RAB parameter message with service information from a CN 30 (Step 100), an SRNC 20 determines service parameters to be transmitted to a DRNC 10 among the service information (or service parameters) included in the received RAB parameter message (Step 101). As mentioned above, however, the SRNC 20 can also select a specific common channel among available common channels and transmit the selected common channel. For example, in the case of an uplink, the SRNC 20 can previously determine (select) a common channel to be used between the RACH and the CPCH, and then transmit information of the determined common channel. In this case, the SRNC 20 must recognize whether the DRNC 10 provides the CPCH.

[0035] After determining the service parameters to be transmitted to the DRNC 10 among the service parameters received from the CN 30, the SRNC 20 transmits the determined service parameters or information on the type of the selected common channel to the DRNC 10 along with a Common Transport Channel Resources Request message (Step 102). Of course, it is also possible to define a new procedure instead of using the Common Transport Channel Resources Request message.

[0036] Upon receiving the Common Transport Channel Resources Request message from the SRNC 20, the DRNC 10 determines a common channel to be used by the UE by detecting the service parameters included in the received Common Transport Channel Resources Request message and analyzing the detected service parameters (Step 103). The DRNC 10 can also determine the common channel to be allocated to the UE considering a current state of the common channels in addition to the service parameters included in the received Common Transport Channel Resources Request message. That is, the DRNC 10 can select a common channel less frequently used by other UEs among a plurality of available common channels.

[0037] After determining the common channel to be allocated to the UE, the DRNC 10 transmits information on the determined common channel to the SRNC 20 along with a Common Transport Channel Resources Response message (Step 104). The Common Transport Channel Resources Response message may include additional information such as information on a transport channel and a physical channel of the determined common channel, or its priority.

[0038] A procedure for transmitting the service parameters from the SRNC 20 to the DRNC 10 and a procedure for determining a common channel by the DRNC 10 using the service parameters received from the SRNC 20 will be described in detail with reference to FIGs. 2 and 3, respectively.

[0039] FIG. 2 illustrates a procedure for transmitting service parameters required for allocating a common channel from the SRNC to the DRNC according to an embodiment of the present invention. Referring to FIG. 2, in step 201, the SRNC 20 determines service parameters to be transmitted to the DRNC 10 among service parameters included in a RAB parameter message received from the CN 30. Here, the SRNC 20 can select partial service parameters shown in Table 2 from the service parameters included in the RAB parameter message, as the service parameters to be transmitted to the DRNC 10. For example, the service parameters to be transmitted to the DRNC 10 may include the maximum bit rate or the guaranteed bit rate. The service parameters transmitted from the SRNC 20 to the DRNC 10 are service parameters decided to be necessarily considered by the DRNC 10 in determining the common channel.

[0040] In step 202, the SRNC 20 transmits the determined service parameters to the DRNC 10 along with an RNSAP (Radio Network Subsystem Application Part) signaling message. For example, the RNSAP signaling message used to transmit the service parameters may be a Common Transport Channel Resources Request message.

[0041] In step 203, the SRNC 20 receives an RNSAP Response signaling message from the DRNC 10 in response to the Common Transport Channel Resources Request message.

[0042] In step 204, the SRNC 20 detects information on a common channel to be allocated by the DRNC 10 to the UE included in the received RNSAP Response signaling message by analyzing the RNSAP Response signaling message, and transmits the detected common channel information to the UE using an RRC (Radio Resource Control) message.

[0043] In step 205, upon receiving an RRC Response message from the UE in response to the RRC message, the SRNC 20 starts exchanging data from the DRNC 10 with the CN 30, and then ends the procedure after the data exchange.

[0044] FIG. 3 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to an embodiment of the present invention. Referring to FIG. 3, in step 301, the DRNC 10 receives an RNSAP signaling message from the SRNC 20. In step 302, the DRNC 10 detects service parameters included in the received RNSAP signaling message, i.e., a Common Transport Channel Resources Request message, analyzes the detected service parameters, and then determines a common channel to be allocated to the UE based on the analyzed service parameters. In the case of the uplink, the DRNC 10 selects a common channel to be used out of the RACH and the CPCH, and then determines the most preferred common channel among PRACHs currently available in the DRNC 10 or the CPCH sets for the respective cases, based on the received service parameters. Alternatively, the DRNC 10 can determine a common channel to be allocated to the UE considering a state of the common channels currently in use.

[0045] In step 303, the DRNC 10 transmits information on the determined common channel to the SRNC 20 along with an RNSAP Response signaling message, a response message replying to the RNSAP signaling message received from the SRNC 20. The DRNC 10 starts exchanging data from the SRNC 20 with the UE in step 304, and then ends the procedure after the data exchange.

[0046] Next, upon receiving an RAB parameter message from the CN 30, the SRNC 20 selects the type of a common channel to be allocated to the UE based on the service parameters included in the received RAB parameter message, and then transmits the service parameters for the selected common channel and the corresponding information to the DRNC 10. The DRNC 10 then allocates a common channel to the UE based on the type of the common channel and the service parameters, received from the SRNC 20. This procedure will be described in detail with reference to FIGs. 4 and 5.

[0047] FIG. 4 illustrates a procedure for transmitting the service parameters required for allocating a common channel from the SRNC to the DRNC according to another embodiment of the present invention. Referring to FIG. 4, upon receiving a RAB parameter message from the CN 30, the SRNC 20 determines service parameters to be transmitted to the DRNC 10 among service parameters included in the received RAB parameter message in step 401. Likewise,

the service parameters to be transmitted from the SRNC 20 to the DRNC 10 may include some of the service parameters included in the RAB parameter message. For example, the service parameters transmitted to the DRNC 10 may include the maximum bit rate or the guaranteed bit rate. Such service parameters are service parameters decided to be necessarily considered by the DRNC 10 in determining the common channel.

[0048] In step 402, the SRNC 20 selects the type of a common channel to be allocated to the UE based on the service parameters included in the received RAB parameter message. Here, if the common channel to be allocated to the UE is a downlink common channel, the step 402 can be omitted because only one type of the common channel is defined currently. This is because the currently defined downlink common channel includes only the FACH. However, the currently defined uplink common channel includes the RACH and the CPCH. Therefore, the SRNC 20 can first select a preferred common channel out of the two common channels, based on the service parameters included in the RAB parameter message received from the CN 30, and then send a request for the selected common channel to the DRNC 10. Here, the SRNC 20 must previously recognize whether the DRNC 10 supports the CPCH.

[0049] In step 403, the SRNC 20 transmits the determined service parameters and the common channel information to the DRNC 10 along with the RNSAP signaling message. For example, the RNSAP signaling message used in transmitting the service parameters and the common channel information may be a Common Transport Channel Resources Request message.

[0050] In step 404, the SRNC 20 receives an RNSAP Response signaling message, a response message answering to the RNSAP signaling message, from the DRNC 10. The received RNSAP Response signaling message, i.e., a Common Transport Channel Resources Response message, includes information on the common channel determined by the DRNC 10.

[0051] In step 405, the SRNC 20 detects information on the common channel determined by the DRNC by analyzing the RNSAP Response signaling message, and then transmits the detected information to the UE along with an RRC message. In step 406, upon receiving an RRC Response message, a response message replying to the transmitted RRC message, from the UE, the SRNC 20 starts exchanging data with the CN 30 and the DRNC 10, and then ends the procedure after the data exchange.

[0052] FIG. 5 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to another embodiment of the present invention. Referring to FIG. 5, in step 501, the DRNC 10 receives an RNSAP signaling message, i.e., the Common Transport Channel Resources Request message, from the SRNC 20. The DRNC 10 detects service parameters and the type of the common channel from the received Common Transport Channel Resources Request message.

[0053] In step 502, the DRNC 10 determines whether the type of the common channel included in the Common Transport Channel Resources Request message is an RACH, given that the common channel allocated to the UE is an uplink common channel. Thus, the DRNC 10 determines whether the type of the common channel allocated by the SRNC 20 is an RACH. As a result of the determination, if the type of the common channel is the RACH, the DRNC 10 proceeds to step 503. Otherwise, if the type of the common channel is not the RACH, but the CPCH, then the DRNC 10 proceeds to step 506. In addition, if the common channel to be allocated to the UE is a downlink common channel, the SRNC 20 is not required to separately determine the type of the common channel as shown in FIGs. 2 and 3, because the downlink common channel includes only the FACH.

[0054] In step 503, the DRNC 10 determines a PRACH based on the detected service parameters. Here, the DRNC 10 determines a PRACH among PRACHs defined in the DRNC 10 based on the service parameters detected from the RAB parameter message. Further, the DRNC 10 determines a PRACH for the UE considering a state of the PRACHs currently in use.

[0055] Next, in step 504, the DRNC 10 transmits information on the determined PRACH and its associated RACH to the SRNC 20 along with an RNSAP Response message, i.e., the Common Transport Channel Resources Response message. In step 505, the DRNC 10 starts exchanging data with the UE and the SRNC 20, and then ends the procedure after the data exchange.

[0056] Meanwhile, if it is determined in step 502 that the type of the common channel is not the RACH, the DRNC 10 determines a CPCH set based on the detected service parameters in step 506. Here, the DRNC 10 determines a preferred CPCH set among CPCH sets defined in the DRNC 10, based on the detected service parameters. Alternatively, the DRNC 10 can also select a CPCH set to be allocated to the UE considering a state of the CPCH sets currently in use. Since the CPCH sets have different characteristics, the DRNC 10 can determine a preferred CPCH set considering the detected service parameters such as the maximum bit rate.

[0057] In step 507, the DRNC 10 transmits information on the determined CPCH set and the determined CPCH set's ID to the SRNC 20 along with an RNSAP Response signaling message, i.e., the Common Transport Channel Resources Response message. In step 508, the DRNC 10 starts receiving a CPCH from the UE and transmitting the received CPCH to the SRNC 20, and then ends the procedure after the data transmission

[0058] Next, a detailed description will be made of a method for selecting the CPCH among the common channels and then allocating the selected CPCH. In general, as for the CPCH, a plurality of CPCH sets are included in the DRNC,

and the DRNC allocates different CPCH sets according to the services. In this case, in order to determine a proper CPCH set for a specific UE, the DRNC should be provided with information on the service requested or received by the UE from the SRNC. Shown in Table 3 is information on the CPCH sets included in the DRNC.

Table 3

CPCH Set	Minimum SF	Num of PCPCH	TTI	Channel Coding	Num of Signatures
CPCH Set 1	SF4	4	10ms	1/3 turbo coding	8
CPCH Set 2	SF8	8	10ms	1/3 turbo coding	8
CPCH Set 3	SF8	16	20ms	1/2 convolution coding	16
CPCH Set 4	SF16	32	20ms	1/2 convolution coding	16

[0059] Referring to Table 3, the DRNC has 4 CPCH sets included in its cell, and the CPCH sets have different information on the minimum SF value, the number of physical common packet channels (PCPCHs), the TTI value of transport format set information, and the number of signatures available for the CPCPH set. As a result, the UEs allocated different CPCH sets are provided with the services having different bit rates.

[0060] The DRNC uses the maximum bit rate included in the RNSAP signaling message received from the SRNC in order to allocate a specific CPCH set to a specific UE among the CPCH sets allocated to the DRNC itself. Upon receiving the maximum bit rate, the DRNC selects a CPCH set capable of supporting the received maximum bit rate among the CPCH sets currently included in the DRNC, and transmits information on the selected CPCH set to the SRNC.

[0061] Shown in Table 4 are bit rates available for the respective SF values.

Table 4

SF	Channel Bit Rate	Data Bit Rate (1/2 coding)	Data Bit Rate (1/3 coding)
4	960Kbps	480Kbps	320Kbps
8	480Kbps	240Kbps	160Kbps
16	240Kbps	120Kbps	80Kbps
32	120Kbps	60Kbps	40Kbps
64	60Kbps	30Kbps	20Kbps
128	30Kbps	15Kbps	10Kbps
256	15Kbps	7.5Kbps	5Kbps
...	...	...	...

[0062] Table 4 shows the bit rates available for the respective SF values according to the coding rates. For example, if SF=4, the original channel bit rate is 960Kbps and the bit rate is 480Kbps for 1/2 coding and 320Kbps for 1/3 coding.

[0063] Next, shown in Table 5 are maximum bit rates and associated CPCH sets available for (or allocable to) the corresponding maximum bit rates.

Table 5

Max Bit Rate	Min SF with 1/2 coding	Min SF with 1/3 coding	Available CPCH sets
5.15Kbps	256	128	CPCH set 1, 2, 3, 4
12.2Kbps	128	64	CPCH set 1, 2, 3, 4
14.4Kbps	64	64	CPCH set 1, 2, 3, 4
28.8Kbps	64 or 32	32	CPCH set 1, 2, 3, 4
57.6Kbps	32 or 16	32	CPCH set 1, 2, 3, 4
32Kbps	32	32	CPCH set 1, 2, 3, 4

Table 5 (continued)

Max Bit Rate	Min SF with 1/2 coding	Min SF with 1/3 coding	Available CPCH sets
64Kbps	16	32	CPCH set 1, 2, 3, 4
128Kbps	8	8	CPCH set 1, 2, 3
384Kbps	4	4	CPCH set 1
...	...	...	...

[0064] Table 5 shows relationships between the maximum bit rates and associated CPCH sets available for the maximum bit rates, based on Tables 3 and 4. For example, the CPCH set 4 is larger than the CPCH set 3, the CPCH set 3 is larger than the CPCH set 2, and the CPCH set 2 is larger than the CPCH set 1 in the number of available CPCHs. Therefore, when the CPCH sets can be simultaneously allocated, it is possible to set an allocation probability of the CPCH set 2 to be higher than that of the CPCH set 1, an allocation probability of the CPCH set 3 to be higher than that of the CPCH set 2, and an allocation probability of the CPCH set 4 to be higher than that of the CPCH set 3. That is, in FIG. 5, it is preferable to allocate the CPCH set 3 to the UE with the maximum bit rate of 128Kbps. In addition, it is preferable to allocate the CPCH set 4 to the UE with the maximum bit rate of 64Kbps.

[0065] If the SRNC designates a service parameter for a specific UE among the service parameters included in the RAB parameter message received from the CN as the maximum bit rate in an RNSAP signaling message for common channel allocation and transmits the RNSAP signaling message to the DRNC, then the DRNC determines a CPCH set proper for the maximum bit rate parameter in the RNSAP signaling message among the CPCH sets previously included in the DRNC, and then transmits information on the determined CPCH set to the SRNC. Here, a CPCH set ID can be used for the information on the determined CPCH set. The SRNC transmits the received CPCH set ID to the UE using an RRC message.

[0066] The UE then recognizes information on the CPCH set through system information received over a broadcast channel (BCH) from the corresponding cell, and then initiates transmission of the CPCH signal using the received CPCH set information.

[0067] Further, the DRNC can transmit the whole information on the CPCH set to the SRNC along with a CPCH set ID for the determined CPCH. In this case, the SRNC can receive the whole information on the CPCH set for the UE through an RRC message. Therefore, the UE can recognize information on the CPCH set even without receiving the BCH information. Specifically, when a UE transitions from a CELL_DCH state to a CELL_FACH state, the UE can receive information on the common channel to be used in the CELL_FACH state, directly through RRC message not through the BCH. That is, when the SRNC has the service parameters for the UE and the UE performs a handover in a "connected mode" where the UE is connected to a common radio resource, the UE can receive information on the common channel directly through the RRC message and construct the common channel.

[0068] In addition, when the DRNC transmits only specific information of the information on the CPCH set to the SRNC along with the CPCH set ID, the SRNC transmits the information on the CPCH set, received from the DRNC, to the UE through the RRC message, and the UE constructs a CPCH by preferentially applying the received information to overlapped information of the CPCH set information received over the BCH. For example, if the number of signatures available for a specific CPCH set is 16, the DRNC can allow the UE to use some of the 16 available signatures. The DRNC may provide the SRNC with information indicating that only 8 signatures are available for the UE, and upon receiving this information from the SRNC, the UE can access the CPCH set using only the allowed signatures. In this case, the DRNC can control the UE's right to use the CPCH set considering the current state of the cell.

[0069] The method for transmitting the CPCH set-related information can be equally applied even to the RACH and the FACH. The CPCH set can also be equally applied to the PRACH and the FACH, so the present invention is not restrictive to the CPCH, but can be applied to all of the common channels.

[0070] As described above, to select a common channel, the SRNC transmits information stored therein to the DRNC so that the DRNC may determine a proper common channel for the UE, thus increasing utilization efficiency of the common channel and providing various services. In particular, the CPCHs are given different characteristics according to CPCH sets, and then, the DRNC sets an effective CPCH set according to service requests from the UE, thus providing a high-quality service.

[0071] While the invention has been shown and described with reference to a certain preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention as defined by the appended claims.

Claims

1. A method for setting a common channel for a packet data service in a mobile communication system including a User Equipment, UE, a first Node B providing the packet data service to the UE, a Serving Radio Network Controller, SRNC (20), connected to the first Node B, a Core Network, CN (30), connected to the SRNC, and a Drift Radio Network Controller, DRNC (10), connected to the second Node B neighboring the first Node B and also connected to the SRNC, the method comprising the steps of:

   transmitting (102; 202, 301; 403, 501) parameters to the DRNC; and

   receiving (104; 203, 303; 404, 504, 507) information on a common channel determined based on the parameters from the DRNC;

   characterized in that
   the common channel for the packet data service is set by the SRNC to the UE through the DRNC and the second Node B when the UE is handed over from the first Node B to the second Node B as the UE moves to the second Node B;
   the CN has bit rate information for the packet data service and transmits (100) the bit rate information to the SRNC, the SRNC stores the bit rate information, and the parameters are service parameters including the bit rate information for the packet data service; and
   the method further comprises:

   transmitting (204, 304; 405, 505, 508) information on the determined common channel to the UE through the DRNC and the second Node B, to allocate the determined common channel to the UE.

2. The method as claimed in claim 1, wherein the bit rate information includes a maximum bit rate and a guaranteed bit rate.

3. The method as claimed in claim 1 or 2, wherein the common channel is one of a common packet channel, CPCH, a random access channel, RACH, and a forward access channel, FACH.

4. The method as claimed in one of claims 1 to 3, wherein:

   the service parameters are transmitted to the DRNC using a Radio Network Subsystem Application Part, RNSAP, message;

   the information on the determined common channel is received from the DRNC through an RNSAP response message; and

   the determined common channel information is transmitted to the UE through a radio resource control message, to allocate the determined common channel to the UE.

5. The method as claimed in claim 4, wherein the RNSAP message includes a common transport channel resources request message.

6. The method as claimed in claim 4, wherein the RNSAP response message includes a common transport channel resources response message.

7. The method as claimed in one of claims 1 to 6, further comprising the step of:

   determining (101; 401) service parameters including the bit rate information for the packet data service, and determining (402) a type of a common channel for transmitting packet data according to the determined service parameters, before transmitting the service parameters,

   wherein the step of transmitting the service parameters comprises:

   transmitting (403) the determined service parameters and the determined common channel type to the DRNC;

wherein the common channel is determined based on the service parameters and the common channel type from the DRNC.

8. The method as claimed in claim 7, further comprising the steps of:

upon receiving (501) the service parameters and the common channel type from the SRNC, determining (502) by the DRNC whether the received common channel type represents a random access channel, RACH;

determining (503) a physical random access channel, PRACH, based on the service parameters, when the common channel type represents the random access channel; and

transmitting (504) information on the determined physical random access channel and the determined random access channel as the common channel information to the SRNC.

9. The method as claimed in claim 7, further comprising the steps of:

determining (506) by the DRNC a common packet channel, CPCH, set according to the service parameters, when the common channel type represents a common packet channel; and

transmitting (507) information on the determined CPCH set and an identification, ID, of the determined CPCH set as the common channel information to the SRNC.

10. A mobile communication system comprising:

a User Equipment, UE;

a first Node B capable of providing a packet data service to the UE;

a Serving Radio Network Controller, SRNC (20), connected to the first Node B;

a Core Network, CN (30), connected to the SRNC;

a second Node B neighboring the first Node B; and

a Drift Radio Network Controller, DRNC (10), connected to the second Node B,

the system being adapted to perform all the steps of the method of one of claims 1 to 9.

Patentansprüche

1. Verfahren zum Festlegen eines gemeinsamen Kanals für einen Paketdatendienst in einem Mobilkommunikationssystem, das ein Benutzergerät, einen ersten Knoten B, der den Paketdatendienst für das Benutzergerät bereitstellt, einen Serving RNC (20), der mit dem ersten Knoten B verbunden ist, ein Kernnetz (30), das mit dem Serving RNC verbunden ist, und einen Drift RNC (10) enthält, der mit dem zweiten Knoten B verbunden ist, der benachbart zu dem ersten Knoten B ist, und des Weiteren mit dem Serving RNC verbunden ist, wobei das Verfahren die folgenden Schritte umfasst:

Senden (102; 202, 301; 403, 501) von Parametern zu dem Drift RNC; und

Empfangen (104; 203, 303; 404, 504, 507) von Informationen über einen gemeinsamen Kanal, der auf Basis der Parameter von dem Drift RNC bestimmt wird;

dadurch gekennzeichnet, dass:

der gemeinsame Kanal für den Paketdatendienst von dem Serving RNC zu dem Benutzergerät über den Drift RNC und den zweiten Knoten B festgelegt wird, wenn das Benutzergerät von dem ersten Knoten B an den zweiten Knoten B übergeben wird, wenn sich das Benutzergerät zu dem zweiten Knoten B bewegt;

das Kernnetz über Bitrateninformationen für den Paketdatendienst verfügt und die Bitrateninformationen zu dem Serving-R NC sendet, wobei der Serving-RNC die Bitrateninformationen speichert und die Parameter Dienstparameter sind, die die Bitrateninformationen für den Paketdatendienst enthalten; und

das Verfahren des Weiteren umfasst:

Senden (204, 304; 405, 505, 508) von Informationen über den bestimmten gemeinsamen Kanal zu dem Benutzergerät über den Drift RNC und den zweiten Knoten B, um dem Benutzergerät den bestimmten gemeinsamen Kanal zuzuweisen.

2. Verfahren nach Anspruch 1, wobei die Bitrateninformationen eine maximale Bitrate und eine garantierte Bitrate enthalten.

3. Verfahren nach Anspruch 1 oder 2, wobei der gemeinsame Kanal ein Common Packet Channel, ein Random Access Channel oder ein Forward Access Channel ist.

4. Verfahren nach einem der Ansprüche 1 bis 3, wobei die Dienstparameter zu dem Drift RNC unter Verwendung einer Radio-Network-Subsystem-Anwendungsteil-Mitteilung gesendet werden;
die Informationen über den bestimmten gemeinsamen Kanal von dem Drift RNC über eine Radio-Network-Subsystem-Anwendungsteil-Antwortmitteilung empfangen werden, und
die Informationen über den bestimmten gemeinsamen Kanal zu dem Endgerät über eine Radio-Ressource-Control-Mitteilung gesendet wird, um dem Benutzergerät den bestimmten gemeinsamen Kanal zuzuweisen.

5. Verfahren nach Anspruch 4, wobei die Radio-Network-Subsystem-Anwendungsteil-Mitteilung eine Ressoursen-Anforderungsmitteilung für einen gemeinsamen Transportkanal enthält.

6. Verfahren nach Anspruch 4, wobei die Radio-Network-Subsystem-Anwendungsteil-Antwortmitteilung eine Antwortmitteilung über gemeinsame Transportkanalresourcen enthält.

7. Verfahren nach einem der Ansprüche 1 bis 6, das des Weiteren den folgenden Schritt umfasst:

Bestimmen (101; 401) von Dienstparametern, die die Bitrateninformationen für den Paketdatendienst enthalten, und Bestimmen (402) eines Typs eines gemeinsamen Kanals zum Senden von Paketdaten entsprechend den bestimmten Dienstparametem vor dem Senden der Dienstparameter,

wobei der Schritt des Sendens der Dienstparameter umfasst:

Senden (403) der bestimmten Dienstparameter und des bestimmten Typs des gemeinsamen Kanals zu dem Drift RNC;

wobei der gemeinsame Kanal auf Basis der Dienstparameter und des Typs des gemeinsamen Kanals von dem Drift RNC bestimmt wird.

8. Verfahren nach Anspruch 7, das des Weiteren die folgenden Schritte umfasst:

beim Empfangen (501) der Dienstparameter und des Typs des gemeinsamen Kanals von dem Serving RNC Bestimmen (502) durch den Drift RNC, ob der empfangene Typ des gemeinsamen Kanals einen Random Access Channel darstellt,;

Bestimmen (503) eines Physical Random Access Channel auf Basis der Dienstparameter, wenn der Typ des gemeinsamen Kanals den Random Access Channel darstellt; und

Senden (504) von Informationen über den bestimmten Physical Random Access Channel und den bestimmten Random Access Channel als die Informationen über den gemeinsamen Kanal zu dem Serving RNC.

9. Verfahren nach Anspruch 7, das des Weiteren die folgenden Schritte umfasst:

Bestimmen (506) eines Common Packet Channel, der entsprechend den Dienstparametern festgelegt wird,

durch den Drift RNC, wenn der Typ des gemeinsamen Kanals einen Common Packet Channel darstellt; und Senden (507) von Informationen über den festgelegten bestimmten Common Packet Channel sowie einer Kennung des festgelegten bestimmten Common Packet Channel als die Informationen über den gemeinsamen Kanal zu dem Serving RNC.

10. Mobilkommunikationssystem, das umfasst:

ein Benutzergerät;

einen ersten Knoten B, der in der Lage ist, dem Benutzergerät einen Paketdatendienst bereitzustellen;

einen Serving RNC (20), der mit dem ersten Knoten B verbunden ist,

ein kernnetz (30), das mit dem Serving RNC verbunden ist;

einen zweiten Knoten B, der benachbart zu dem ersten Knoten B ist; und

einen Drift RNC (10), der mit dem zweiten Knoten B verbunden ist,

wobei das System so eingerichtet ist, dass es alle Schritte des Verfahrens nach einem der Ansprüche 1 bis 9 durchführt.

Revendications

1. Procédé pour établir un canal commun pour un service de données en paquets dans un système de communication mobile incluant un équipement d'utilisateur, UE (User Equipment), un premier Node B (station de base), fournissant le service de données en paquets à l'UE, un contrôleur de réseau radio de desserte, SRNC (Serving Radio Network Controller) (20), connecté au premier Node B, un réseau coeur, CN (Core Network) (30), connecté au SRNC, et un contrôleur de réseau radio de routage, DRNC (Drift Radio Network Controller) (10), connecté au second Node B voisin du premier Node B et également connecté au SRNC, le procédé comprenant les étapes suivantes :

on émet (102; 202, 301; 403, 501) des paramètres vers le DRNC; et
on reçoit (104; 203, 303; 404, 504, 507) de l'information sur un canal commun déterminé sur la base des paramètres provenant du DRNC;

caractérisé en ce que
le canal commun pour le service de données en paquets est établi par le SRNC vers l'UE par l'intermédiaire du DRNC et du second Node B lorsque l'UE est transféré du premier Node B au second Node B pendant que l'UE se déplace vers le second Node B;
le CN dispose d'une information de débit binaire pour le service de données de paquets et émet (100) l'information de débit binaire vers le SRNC, le SRNC stocke l'information de débit binaire, et les paramètres sont des paramètres de service incluant l'information de débit binaire pour le service de données en paquets; et
le procédé comprend en outre :

l'émission (204, 304; 405, 505, 508) d'information sur le canal commun déterminé, vers l' UE par l'intermédiaire du DRNC et du second Node B, pour allouer à l'UE le canal commun déterminé.

2. Procédé selon la revendication 1, dans lequel l'information de débit binaire comprend un débit binaire maximal et un débit binaire garanti.

3. Procédé selon la revendication 1 ou 2, dans lequel le canal commun est l'un d'un canal de paquets commun, CPCH (Common Packet Channel), d'un canal d'accès aléatoire, RACH (Random Access Channel), et d'un canal d'accès d'aller, FACH (Forward Access Channel).

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel :

les paramètres de service sont émis vers le DRNC en utilisant un message de section d'application de sous-

système de réseau radio, RNSAP (Radio Network Subsystem Application Part);
l'information concernant le canal commun déterminé est reçue du DRNC par l'intermédiaire d'un message de réponse de RNSAP, et
l'information de canal commun déterminé est émise vers l'UE par l'intermédiaire d'un message de commande de ressource radio, pour allouer à l'UE le canal commun déterminé.

5. Procédé selon la revendication 4, dans lequel le message de RNSAP comprend un message de demande de ressources de canal de transport commun.

6. Procédé selon la revendication 4, dans lequel le message de réponse de RNSAP comprend un message de réponse de ressources de canal de transport commun.

7. Procédé selon l'une quelconque des revendications 1 à 6, comprenant en outre l'étape suivante :

on détermine (101; 401) des paramètres de service incluant l'information de débit binaire pour le service de données en paquets, et on détermine (402) un type de canal commun pour émettre des données en paquets conformément aux paramètres de service déterminés, avant d'émettre les paramètres de service,

dans lequel l'étape d'émission des paramètres de service comprend :

l'émission (403) vers le DRNC des paramètres de service déterminés et du type de canal commun déterminé;

dans lequel le canal commun est déterminé sur la base des paramètres de service et du type de canal commun provenant du DRNC.

8. Procédé selon la revendication 7, comprenant en outre les étapes suivantes :

à la réception (501) des paramètres de service et du type de canal commun provenant du SRNC, on détermine (502), par le DRNC, si le type de canal commun reçu représente un canal d'accès aléatoire, RACH;
on détermine (503) un canal d'accès aléatoire physique, PRACH, sur la base des paramètres de service, lorsque le type de canal commun représente le canal d'accès aléatoire; et
on émet (504) vers le SRNC, en tant qu'information de canal commun, de l'information sur le canal d'accès aléatoire physique déterminé et le canal d'accès aléatoire déterminé.

9. Procédé selon la revendication 7, comprenant en outre les étapes suivantes :

on détermine (506) par le DRNC un canal de paquets commun, CPCH, établi conformément aux paramètres de service, lorsque le type de canal commun représente un canal de paquets commun; et
on émet (507) vers le SRNC, en tant qu'information de canal commun, de l'information sur le CPCH déterminé établi, et une identification, ID, du CPCH déterminé établi.

10. Système de communication mobile, comprenant :

un équipement d'utilisateur, UE (User Equipment);
un premier Node B (station de base) capable de fournir un service de données en paquets à l' UE;
un contrôleur de réseau radio de desserte, SRNC (Serving Radio Network Controller) (20), connecté au premier Node B;
un réseau coeur, CN (Core Network) (30), connecté au SRNC;
un second Node B voisin du premier Node B; et
un contrôleur de réseau radio de routage, DRNC (Drift Radio Network Controller) (10), connecté au second Node B,
le système étant adapté pour accomplir toutes les étapes du procédé de l'une des revendications 1 à 9.

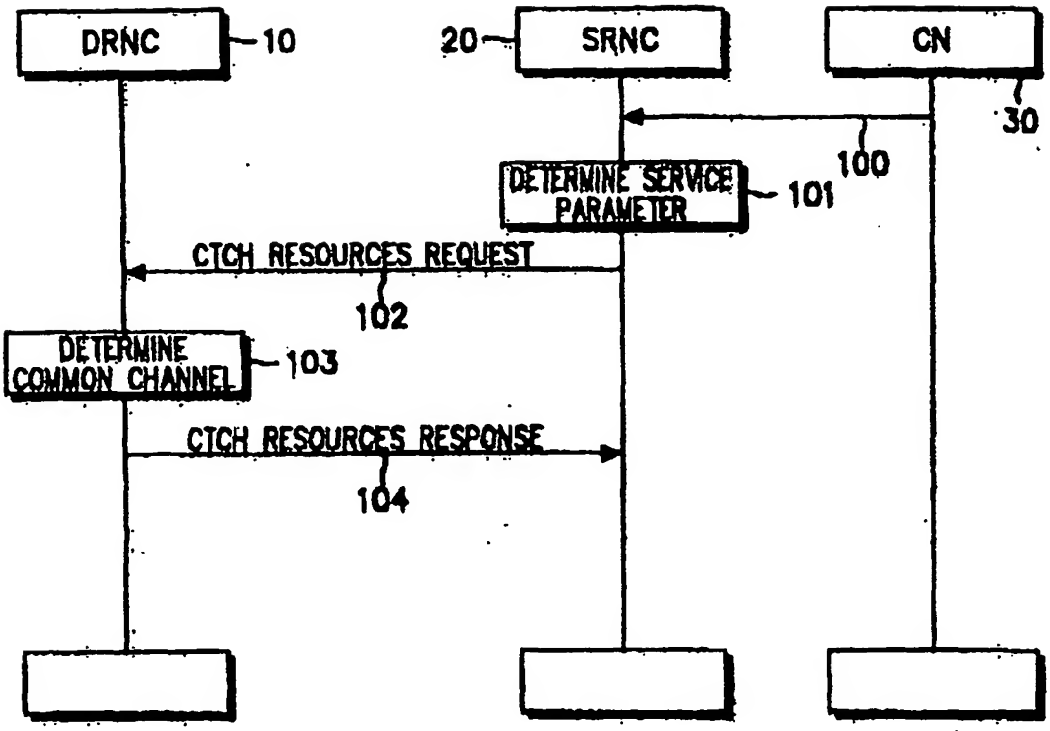
DRNC
10
20
SRNC
CN
30
100
DETERMINE SERVICE PARAMETER
101
CTCH RESOURCES REQUEST
102
DETERMINE COMMON CHANNEL
103
CTCH RESOURCES RESPONSE
104

FIG. 1

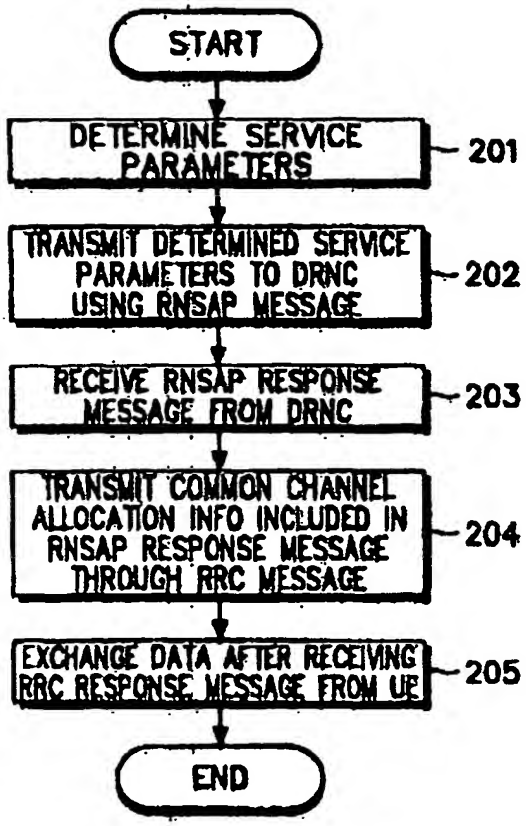
START
DETERMINE SERVICE PARAMETERS
201
TRANSMIT DETERMINED SERVICE PARAMETERS TO DRNC USING RNSAP MESSAGE
202
RECEIVE RNSAP RESPONSE MESSAGE FROM DRNC
203
TRANSMIT COMMON CHANNEL ALLOCATION INFO INCLUDED IN RNSAP RESPONSE MESSAGE THROUGH RRC MESSAGE
204
EXCHANGE DATA AFTER RECEIVING RRC RESPONSE MESSAGE FROM UE
205
END

FIG. 2

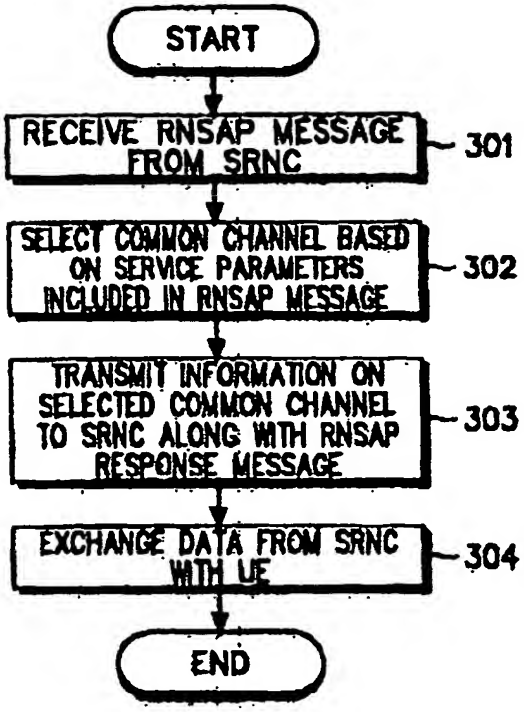
START
RECEIVE RNSAP MESSAGE FROM SRNC
301
SELECT COMMON CHANNEL BASED ON SERVICE PARAMETERS INCLUDED IN RNSAP MESSAGE
302
TRANSMIT INFORMATION ON SELECTED COMMON CHANNEL TO SRNC ALONG WITH RNSAP RESPONSE MESSAGE
303
EXCHANGE DATA FROM SRNC WITH UE
304
END

FIG. 3

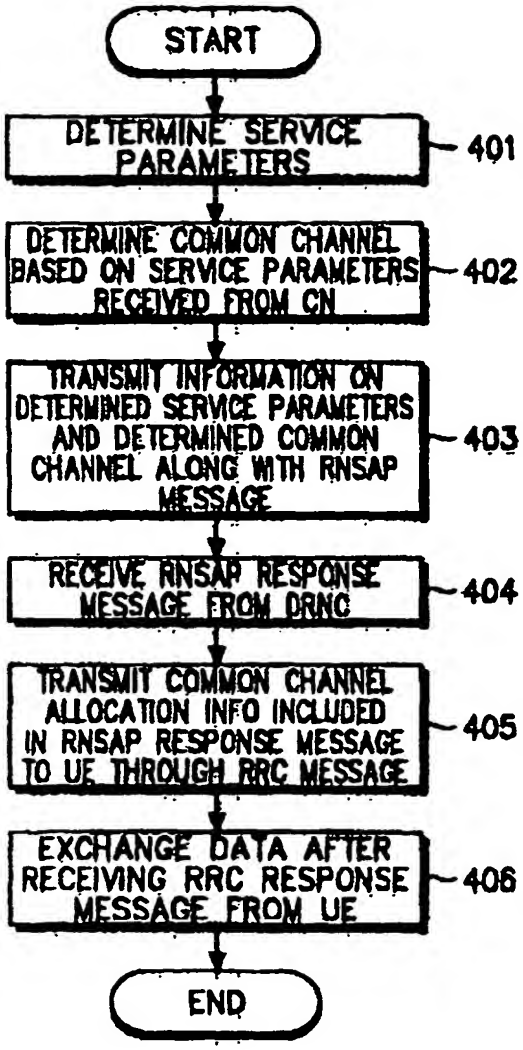
START
DETERMINE SERVICE PARAMETERS
401
DETERMINE COMMON CHANNEL BASED ON SERVICE PARAMETERS RECEIVED FROM CN
402
TRANSMIT INFORMATION ON DETERMINED SERVICE PARAMETERS AND DETERMINED COMMON CHANNEL ALONG WITH RNSAP MESSAGE
403
RECEIVE RNSAP RESPONSE MESSAGE FROM DRNC
404
TRANSMIT COMMON CHANNEL ALLOCATION INFO INCLUDED IN RNSAP RESPONSE MESSAGE TO UE THROUGH RRC MESSAGE
405
EXCHANGE DATA AFTER RECEIVING RRC RESPONSE MESSAGE FROM UE
406
END

FIG. 4

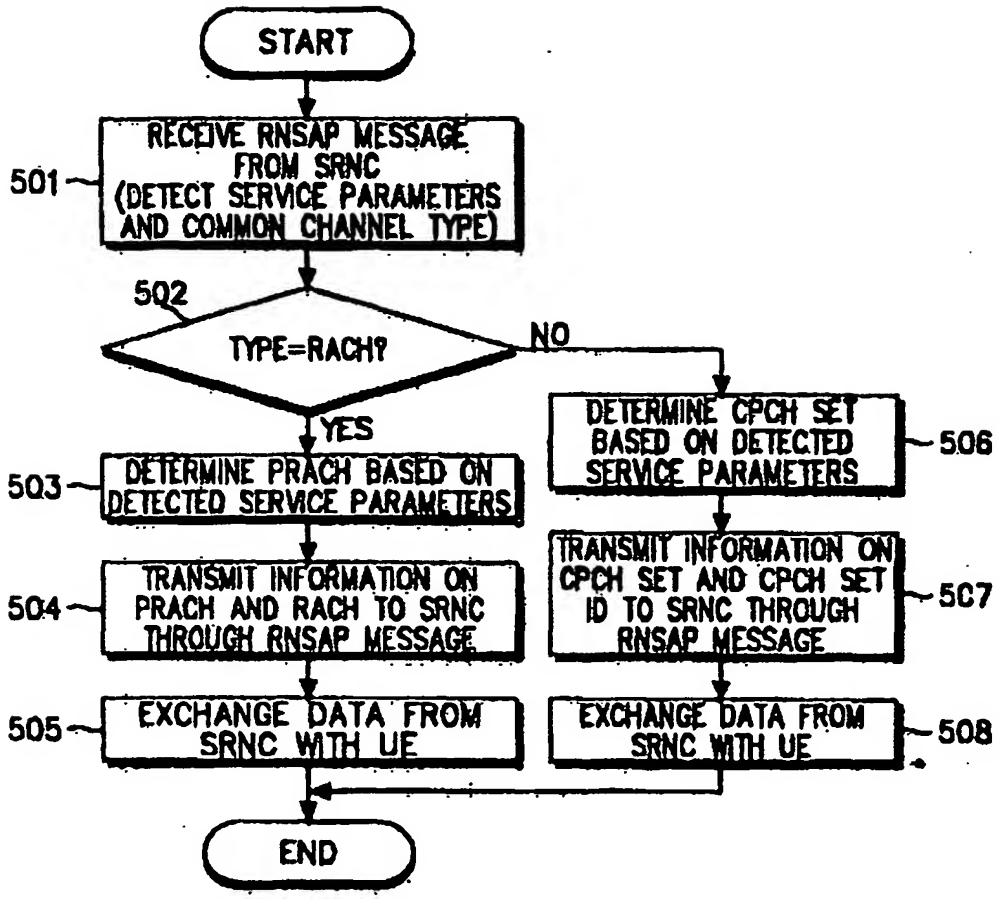
START
RECEIVE RNSAP MESSAGE FROM SRNC (DETECT SERVICE PARAMETERS AND COMMON CHANNEL TYPE)
501
502
TYPE=RACH?
NO
YES
DETERMINE PRACH BASED ON DETECTED SERVICE PARAMETERS
503
TRANSMIT INFORMATION ON PRACH AND RACH TO SRNC THROUGH RNSAP MESSAGE
504
EXCHANGE DATA FROM SRNC WITH UE
505
DETERMINE CPCH SET BASED ON DETECTED SERVICE PARAMETERS
506
TRANSMIT INFORMATION ON CPCH SET AND CPCH SET ID TO SRNC THROUGH RNSAP MESSAGE
507
EXCHANGE DATA FROM SRNC WITH UE
508
END

FIG. 5

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(54) Apparatus and method for allocating a common channel in a CDMA mobile communication system

(57) Disclosed is a method for setting a common channel for a packet data service by an SRNC through a UE and a DRNC when the UE is handed over from a first Node B to a second Node B as the UE moves to the second Node B, in a mobile communication system. The SRNC transmits service parameters including bit rate information for the packet data service to the DRNC, and receives information on a common channel determined based on the service parameters from the DRNC. The SRNC transmits information on the determined common channel to the UE through the DRNC and the second Node B, to allocate the determined common channel to the UE.

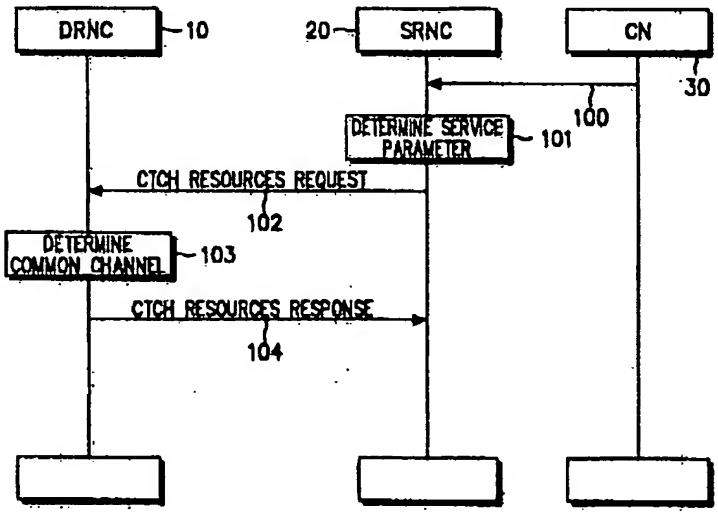

FIG. 1

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 12 7954

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	"Universal Mobile Telecommunication System (UMTS); UTRAN Iur Interface RNSAP Signalling (3GPP TS 25.423 Version 3.3.0 Release 1999)" ETSI TS 125 423 V3.3.0, September 2000 (2000-09), XP002220187 * page 48, line 21 - line 50 * * page 109 - page 112 * * page 122 * * page 133 * in particular sections: 8.4.1, 9.1.35, 9.2.1.24, 9.2.1.36, 9.2.1.60, 9.2.1.61 * figure 27 *	1-12	H04Q7/38
Y	WO 00 44191 A (SUBBIAH BARANITHARAN) 27 July 2000 (2000-07-27) * page 8, line 19 - page 10, line 11 * * page 12, line 8 - line 21 * * page 15, line 10 - page 18, line 21 * * claims 1,2,9; figures 2,4-7 *	1-12	
P,A	WO 01 89235 A (ERICSSON TELEFON AB L M) 22 November 2001 (2001-11-22) * page 3, line 6 - page 4, line 10 * * page 5, line 6 - page 8, line 4 * * page 12, line 16 - page 21, line 20; claims 1-4,6,9-11,15 *	1-12	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04Q H04L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	13 November 2002	Donnini, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 12 7954

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-11-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0044191 A	27-07-2000	AU 2861500 A	07-08-2000
		EP 1157576 A1	28-11-2001
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		WO 0189235 A2	22-11-2001

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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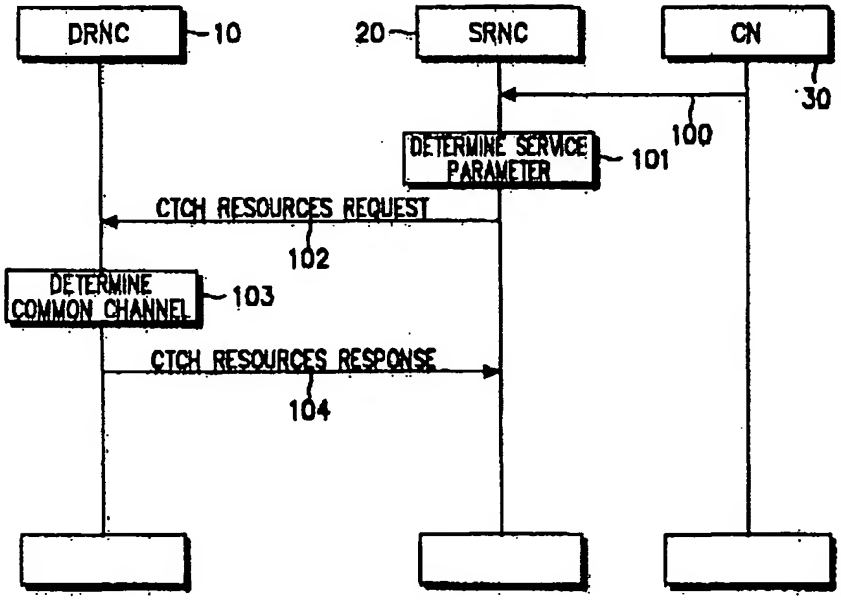

FIG. 1

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Description

PRIORITY

[0001] This application claims priority to an application entitled "Apparatus and Method for Allocating Common Channel in a CDMA Mobile Communication System" filed in the Korean Industrial Property Office on November 23, 2000 and assigned Serial No. 2000-70099, the contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates generally to a method for allocating a common channel in a CDMA (Code Division Multiple Access) mobile communication system, and in particular, to an apparatus and method for allocating a common channel in the case that a serving radio network controller (SRNC) is different from a drift radio network controller (DRNC).

2. Description of the Related Art

[0003] With the rapid development of the mobile communication industry, a future mobile communication system will provide not only a voice (circuit) service but also advanced services such as a data service and an image service. Generally, the future mobile communication system employs a CDMA (Code Division Multiple Access) system. The CDMA system is classified into a synchronous system and an asynchronous system. The synchronous system is chiefly adopted in United States, while the asynchronous system is mainly adopted in Europe and Japan. However, the standardization work on the future mobile communication system is being separately carried out for the synchronous system and the asynchronous system. The European future mobile communication system is called "UMTS (Universal Mobile Telecommunication System)".

[0004] The standardization provides various specifications for the data service and the images service as well as the voice service, required in the future mobile communication system, and particularly, for channel allocation.

[0005] A UMTS W-CDMA (Wideband Code Division Multiple Access) communication system, the European future mobile communication system, uses a random access channel (RACH) and a common packet channel (CPCH) as a reverse common channel, and uses a forward access channel (FACH) as a forward common channel.

[0006] Among the reverse common channels of the W-CDMA communication system, the RACH can have characteristics dependent on a TTI (Transmit Time Interval) and a channel coding mode, and is mapped with a physical random access channel (PRACH) on a one-to-one basis. Further, the PRACH can have characteristics being dependent on available signatures and an access sub-channel. Therefore, the RACHs can be distinguished (identified) based on the TTI and the channel coding mode, while the PRACHs can be distinguished according to the number of available signatures and the access sub-channel. In addition, an available spreading factor (SF) can be also used in distinguishing the PRACHs.

[0007] As the RACHs and PRACHs have various characteristics, they can be used for different purposes according to their service types. In addition, information on the RACH/PRACH is broadcast by a Node B, and upon receiving the RACH/PRACH information, a UE can select which RACH/PRACH to use depending on the received RACH/PRACH information. Alternatively, the Node B can select the RACH/PRACH to be used by a specific UE based on a service to be used by the UE, and then inform the UE of the selected RACH/PRACH.

[0008] Like the RACH, the FACH and the CPCH also have different characteristics to provide different services, so that the UE can select proper FACH and CPCH according to the characteristics of the FACH and CPCH provided from the Node B. Alternatively, the Node B can determine the FACH and the CPCH to be used by the UE and then transmit information on the determined FACH and CPCH to the UE.

[0009] Meanwhile, common channels such as the RACH, the FACH and the CPCH are allocated to the UEs by a serving radio network controller (SRNC). The SRNC connected to a core network (CN) exchanges information on a service provided between the UE and the CN. The SRNC determines a channel to be allocated to the UE using the service information transmitted from the CN.

[0010] Shown in Tables 1A to 1C are RAB (Radio Access Bearer) parameters of a service information message used by the CN to inform the SRNC of the service information.

Table 1A

IE/Group Name	Presence	Range	IE type and reference	Semantics description
RAB parameters				
>Traffic Class	M		ENUMERATED (conversational, streaming, interactive, background, ...)	**Desc.**: This IE indicates the type of application for which the Radio Access Bearer service is optimised
>RAB Asymmetry Indicator	M		ENUMERATED (Symmetric bidirectional Asymmetric Uni directional downlink, Asymmetric Uni directional Uplink, Asymmetric Bidirectional, ...)	**Desc.**: This IE indicates asymmetry or symmetry of the RAB and traffic direction

Table 1B

>Delivery Order	M		ENUMERATED (delivery order requested, delivery order not requested)	**Desc:** This IE indicates that whether the RAB shall provide in-sequence SDU delivery or not **Usage:** Delivery order requested: in sequence delivery shall be guaranteed by UTRAN on all RAB SDUs Delivery order not requested: in sequence delivery is not required from UTRAN
>Maximum SDU size	M		INTEGER (0.. 32768)	**Desc.**: This IE Indicates the maximum allowed SDU size The unit is: bit. **Usage:** Conditional value: set to largest RAB Subflow Combination compound SDU size when present among the different RAB Subflow Combination

Table 1B (continued)

>SDU parameters		1 to <maxRABSubflows>	See below	**Desc.**: This IE contains the parameters characterizing the RAB SDUs **Usage** Given per subflow with first occurence corresponding to subflow#1 etc'
>Transfer Delay	C-iftrafficConv-Stream		INTEGER (0.. 65535)	**Desc.**: This IE indicates the maximum delay for 95th percentile of the distribution of delay for all delivered SDUs during the lifetime of a RAB, where delay for an SDU is defined as the time from a request to transfer an SDU at one SAP to its delivery at the other SAP The unit is: millisecond. **Usage:** -

Table 1C

>Traffic Handling priority	C-iftrafficInteractiv		INTEGER {spare (0), highest (1), lowest (14), no priority used (15)} (0? 5)	**Desc.**: This IE specifies the relative importance for handling of all SDUs belonging to the radio access bearer compared to the SDUs of other bearers **Usage:** -
>Allocation/Retention priority	O		See below	**Desc.**: This IE specifies the relative importance compared to other Radio access bearers for allocation and retention of the Radio access bearer. **Usage:** If this IE is not received, the request is regarded as it cannot trigger the preemption process and it is vulnerable to the preemption process.

Table 1C (continued)

>Source Statistics descriptor	C-iftrafficConv-Stream		ENUMERATED (speech, unknown, ?	**Desc.**: This IE_specifies characteristics of the source of submitted SDUs **Usage:** -

[0011] The SRNC selects a dedicated channel (DCH) or a common channel using the RAB parameters shown in Tables 1A to 1C. If the common channel is selected, the SRNC can select the RACH or the CPCH in response to a service request. In addition, a maximum bit rate and a guaranteed bit rate are used in selecting a minimum SF and a channelization code to be used by the common channel. That is, the SF and the channelization code to be used by the common channel are determined depending on the maximum bit rate and the guaranteed bit rate. Here, the maximum bit rate and the guaranteed bit rate are bit rate information of the packet data.

[0012] In addition, a traffic handling priority and a transfer delay are selected based on the characteristics of the physical channel, i.e., based on the sub-channel and the number of signatures.

[0013] When the UE, with a channel allocated by the SRNC, performs a handover (or handoff), a DRNC, an RNC of a Node B newly accessed by the UE, and the SRNC may be changed. The SRNC and the DRNC are distinguished from the viewpoint of the UE. If the SRNC is connected to the UE not directly, but through the DRNC, then the SRNC cannot personally select a channel and allocate the selected channel to the UE.

[0014] The reasons that the SRNC cannot personally allocate a channel to the UE are as follows.

[0015] First, channels allocated to a cell in the DRNC are determined by the DRNC, because the SRNC does not have information on the allocated common channel in the DRNC. For this reason, the SRNC cannot determine a common channel allocated to the cell in the DRNC. Second, the DRNC or the CN does not have information on a service provided to the UE, so it is difficult to allocate a common channel to be used by the UE. Thus, conventionally, when the SRNC is connected to the UE through the DRNC, i.e., when the UE performs a handover, the UE cannot be allocated a common channel.

SUMMARY OF THE INVENTION

[0016] It is, therefore, an object of the present invention to provide a method in which a serving radio network controller (SRNC) shares service information provided from a core network, so that a drift radio network controller (DRNC) can allocate a common channel to a UE.

[0017] It is another object of the present invention to provide a method in which an SRNC provides a signaling message having service information received from a CN to a DRNC, so that the SRNC and the DRNC exchange information required in allocating a common channel to a specific UE handed over from the SRNC to the DRNC.

[0018] To achieve the above and other objects, there is provided a method for setting a common channel for a packet data service by an SRNC through a Node B to a UE and a DRNC when the UE is handed over from a first Node B to a second Node B as the UE moves to the second Node B, in a mobile communication system. The mobile communication system includes the UE, the first Node B providing the packet data service to the UE, the SRNC connected to the first Node B, and a CN (Core Network) connected to the SRNC. The CN has bit rate information for the packet data service and transmits the bit rate information to the SRNC. The SRNC stores the bit rate information. The DRNC is connected to the second Node B neighboring the first Node B and also connected to the SRNC. The SRNC transmits service parameters including the bit rate information for the packet data service to the DRNC, and receives information on a common channel determined based on the service parameters from the DRNC. The SRNC transmits information on the determined common channel to the UE through the DRNC and the second Node B, to allocate the determined common channel to the UE.

[0019] Preferably, the bit rate information includes a maximum bit rate and a guaranteed bit rate.

[0020] Preferably, the common channel includes a common packet channel (CPCH), a random access channel (RACH) or a forward access channel (FACH).

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a method for allocating a common channel to a UE in the case where an SRNC is different from

a DRNC, according to an embodiment of the present invention;
FIG. 2 illustrates a procedure for transmitting service parameters required for allocating a common channel from the SRNC to the DRNC according to an embodiment of the present invention;
FIG. 3 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to an embodiment of the present invention;
FIG. 4 illustrates a procedure for transmitting the service parameters required for allocating a common channel from the SRNC to the DRNC according to another embodiment of the present invention; and
FIG. 5 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] A preferred embodiment of the present invention will be described herein below with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

[0023] The present invention provides two different embodiments for allocating a common channel to a UE in the case where an SRNC to which the UE belongs is different from a DRNC.

[0024] In a first embodiment, the SRNC transmits service information received from a CN to the DRNC. Upon receiving the service information, the DRNC selects a common channel based on the received service information and then allocates the selected common channel to the UE.

[0025] In a second embodiment, the SRNC selects a common channel service information received from the CN and transmits information on the selected common channel to the DRNC. Upon receiving the information on the common channel, the DRNC allocates a common channel to the UE based on the received common channel information. In the first and second embodiments, the common channel selected by the SRNC may be identical to or different from the common channel selected by the DRNC.

[0026] A description of the first embodiment will be given herein below. As stated above, the service information transmitted from the CN to the SRNC is shown Tables 1A to 1C. In this embodiment, the SRNC should transmit the service information received from the CN to the DRNC. Thus, a definition of a message transmitted from the SRNC to the DRNC will be given.

[0027] The SRNC can transmit the service information received from the CN to the DRNC by including it in a Common Transport Channel Resources Request message. The SRNC transmits some or all of the service information received from the CN to the DRNC, using the Common Transport Channel Resources Request message. Upon receiving the Common Transport Channel Resources Request message, the DRNC detects the service information included in the received Common Transport Channel Resources Request message. The DRNC then allocates a common transport channel or a common physical channel to the UE based on the detected service information. Shown in Table 2 is a format of the Common Transport Channel Resources Request message according to the first embodiment of the present invention.

Table 2

IE/Group Name	Presence	Range	IE type and reference	Semantics description	Criticality	Assigned Criticality
Message Type	M		9.2.1.40		YES	Reject
Transaction ID	M		9.2.1.59		YES	Reject
D-RNTI	M		9.2.1.25		YES	Reject
C-ID	O		9.2.1.61	Request a new transport bearer or to use an existing bearer for the user plane	YES	Reject
Transport Bearer Request Indicator	M		9.2.1.60	Indicates the Iur transport bearer to be used for the user plane	YES	Reject
Transport Bearer ID	M					
RAB information		0..1				
>Traffic Class	O					
>RAB Asymmetry Indicator	O					
>Maximum Bit Rate	O					
>Guaranteed Bit Rate	O					
>Delivery Order	O					
>Transfer Delay	O					
>Traffic Handling priority	O					
>Allocation/Retention priority	O					
>Priority level	O					
>Pre-emption Capability	O					
>Pre-emption Vulnerability	O					
>Queuing allowed	O					

[0028] Table 2 shows some of the service information received from the CN. Specially, it is noted that in table 2, parameters mentioned following "the RAB information" row, i.e., from *">Traffic Class"* to *">Queuing Allowed"*, can be included in the RAB information and thus, they can be grouped in the RAB information. That is, in selecting service information required for selecting a common channel, the SRNC may select all of the service information received from the CN or partially selects only the necessary information shown in Table 2.

[0029] The service information required by the DRNC in allocating a common channel to the UE includes the following parameters that should be transmitted from the SRNC to the DRNC.

(1) Maximum Bit Rate

[0030] The maximum bit rate represents a requirement for a maximum value of a bit rate of data to be transmitted/received over the common channel. Therefore, upon receiving the maximum bit rate, the DRNC allocates the common channel within a range not exceeding the maximum bit rate. This is because the maximum bit rate can become a criterion for determining a spreading factor (SF) indicating a bit rate for a physical channel. Therefore, the maximum bit rate can become a criterion for selecting a random access channel (RACH) rather than a common packet channel (CPCH), for the SF<32.

(2) Guaranteed Bit Rate

[0031] The guaranteed bit rate represents a requirement for a guaranteed value of a bit rate of data to be transmitted/received over the common channel. Therefore, upon receiving the guaranteed bit rate, the DRNC allocates the common channel within a range capable of guaranteeing the received guaranteed bit rate. For example, if the received guaranteed bit rate requires a spreading factor SF=16, the DRNC allocates the CPCH rather than the RACH. In addition, the DRNC allocates a CPCH set capable of supporting the SF=16 among CPCH sets. Likewise, even in the case of a forward access channel (FACH), the DRNC allocates a secondary common control physical channel (S-CCPCH) capable of supporting the spreading factor SF=16.

[0032] In addition to the maximum bit rate and the guaranteed bit rate, the service information required by the DRNC in allocating a common channel to the UE includes Traffic Class, RAB Asymmetry Indicator, Delivery Order Transfer Delay, Traffic Handling Priority, and Allocation/Retention Priority parameters. These parameters can be used by the DRNC as criterions for selecting a common channel.

[0033] FIG. 1 illustrates a method for allocating a common channel to a UE in the case where an SRNC is different from a DRNC, according to an embodiment of the present invention. Referring to FIG. 1, upon receiving an RAB parameter message with service information from a CN 30 (Step 100), an SRNC 20 determines service parameters to be transmitted to a DRNC 10 among the service information (or service parameters) included in the received RAB parameter message (Step 101). As mentioned above, however, the SRNC 20 can also select a specific common channel among available common channels and transmit the selected common channel. For example, in the case of an uplink, the SRNC 20 can previously determine (select) a common channel to be used between the RACH and the CPCH, and then transmit information of the determined common channel. In this case, the SRNC 20 must recognize whether the DRNC 10 provides the CPCH.

[0034] After determining the service parameters to be transmitted to the DRNC 10 among the service parameters received from the CN 30, the SRNC 20 transmits the determined service parameters or information on the type of the selected common channel to the DRNC 10 along with a Common Transport Channel Resources Request message (Step 102). Of course, it is also possible to define a new procedure instead of using the Common Transport Channel Resources Request message.

[0035] Upon receiving the Common Transport Channel Resources Request message from the SRNC 20, the DRNC 10 determines a common channel to be used by the UE by detecting the service parameters included in the received Common Transport Channel Resources Request message and analyzing the detected service parameters (Step 103). The DRNC 10 can also determine the common channel to be allocated to the UE considering a current state of the common channels in addition to the service parameters included in the received Common Transport Channel Resources Request message. That is, the DRNC 10 can select a common channel less frequently used by other UEs among a plurality of available common channels.

[0036] After determining the common channel to be allocated to the UE, the DRNC 10 transmits information on the determined common channel to the SRNC 20 along with a Common Transport Channel Resources Response message (Step 104). The Common Transport Channel Resources Response message may include additional information such as information on a transport channel and a physical channel of the determined common channel, or its priority.

[0037] A procedure for transmitting the service parameters from the SRNC 20 to the DRNC 10 and a procedure for determining a common channel by the DRNC 10 using the service parameters received from the SRNC 20 will be described in detail with reference to FIGs. 2 and 3, respectively.

[0038] FIG. 2 illustrates a procedure for transmitting service parameters required for allocating a common channel from the SRNC to the DRNC according to an embodiment of the present invention. Referring to FIG. 2, in step 201, the SRNC 20 determines service parameters to be transmitted to the DRNC 10 among service parameters included in a RAB parameter message received from the CN 30. Here, the SRNC 20 can select partial service parameters shown in Table 2 from the service parameters included in the RAB parameter message, as the service parameters to

be transmitted to the DRNC 10. For example, the service parameters to be transmitted to the DRNC 10 may include the maximum bit rate or the guaranteed bit rate. The service parameters transmitted from the SRNC 20 to the DRNC 10 are service parameters decided to be necessarily considered by the DRNC 10 in determining the common channel.

[0039] In step 202, the SRNC 20 transmits the determined service parameters to the DRNC 10 along with an RNSAP (Radio Network Subsystem Application Part) signaling message. For example, the RNSAP signaling message used to transmit the service parameters may be a Common Transport Channel Resources Request message.

[0040] In step 203, the SRNC 20 receives an RNSAP Response signaling message from the DRNC 10 in response to the Common Transport Channel Resources Request message.

[0041] In step 204, the SRNC 20 detects information on a common channel to be allocated by the DRNC 10 to the UE included in the received RNSAP Response signaling message by analyzing the RNSAP Response signaling message, and transmits the detected common channel information to the UE using an RRC (Radio Resource Control) message.

[0042] In step 205, upon receiving an RRC Response message from the UE in response to the RRC message, the SRNC 20 starts exchanging data from the DRNC 10 with the CN 30, and then ends the procedure after the data exchange.

[0043] FIG. 3 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to an embodiment of the present invention. Referring to FIG. 3, in step 301, the DRNC 10 receives an RNSAP signaling message from the SRNC 20. In step 302, the DRNC 10 detects service parameters included in the received RNSAP signaling message, i.e., a Common Transport Channel Resources Request message, analyzes the detected service parameters, and then determines a common channel to be allocated to the UE based on the analyzed service parameters. In the case of the uplink, the DRNC 10 selects a common channel to be used out of the RACH and the CPCH, and then determines the most preferred common channel among PRACHs currently available in the DRNC 10 or the CPCH sets for the respective cases, based on the received service parameters. Alternatively, the DRNC 10 can determine a common channel to be allocated to the UE considering a state of the common channels currently in use.

[0044] In step 303, the DRNC 10 transmits information on the determined common channel to the SRNC 20 along with an RNSAP Response signaling message, a response message replying to the RNSAP signaling message received from the SRNC 20. The DRNC 10 starts exchanging data from the SRNC 20 with the UE in step 304, and then ends the procedure after the data exchange.

[0045] Next, upon receiving an RAB parameter message from the CN 30, the SRNC 20 selects the type of a common channel to be allocated to the UE based on the service parameters included in the received RAB parameter message, and then transmits the service parameters for the selected common channel and the corresponding information to the DRNC 10. The DRNC 10 then allocates a common channel to the UE based on the type of the common channel and the service parameters, received from the SRNC 20. This procedure will be described in detail with reference to FIGs. 4 and 5.

[0046] FIG. 4 illustrates a procedure for transmitting the service parameters required for allocating a common channel from the SRNC to the DRNC according to another embodiment of the present invention. Referring to FIG. 4, upon receiving a RAB parameter message from the CN 30, the SRNC 20 determines service parameters to be transmitted to the DRNC 10 among service parameters included in the received RAB parameter message in step 401. Likewise, the service parameters to be transmitted from the SRNC 20 to the DRNC 10 may include some of the service parameters included in the RAB parameter message. For example, the service parameters transmitted to the DRNC 10 may include the maximum bit rate or the guaranteed bit rate. Such service parameters are service parameters decided to be necessarily considered by the DRNC 10 in determining the common channel.

[0047] In step 402, the SRNC 20 selects the type of a common channel to be allocated to the UE based on the service parameters included in the received RAB parameter message. Here, if the common channel to be allocated to the UE is a downlink common channel, the step 402 can be omitted because only one type of the common channel is defined currently. This is because the currently defined downlink common channel includes only the FACH. However, the currently defined uplink common channel includes the RACH and the CPCH. Therefore, the SRNC 20 can first select a preferred common channel out of the two common channels, based on the service parameters included in the RAB parameter message received from the CN 30, and then send a request for the selected common channel to the DRNC 10. Here, the SRNC 20 must previously recognize whether the DRNC 10 supports the CPCH.

[0048] In step 403, the SRNC 20 transmits the determined service parameters and the common channel information to the DRNC 10 along with the RNSAP signaling message. For example, the RNSAP signaling message used in transmitting the service parameters and the common channel information may be a Common Transport Channel Resources Request message.

[0049] In step 404, the SRNC 20 receives an RNSAP Response signaling message, a response message answering to the RNSAP signaling message, from the DRNC 10. The received RNSAP Response signaling message, i.e., a Common Transport Channel Resources Response message, includes information on the common channel determined

by the DRNC 10.

[0050] In step 405, the SRNC 20 detects information on the common channel determined by the DRNC by analyzing the RNSAP Response signaling message, and then transmits the detected information to the UE along with an RRC message. In step 406, upon receiving an RRC Response message, a response message replying to the transmitted RRC message, from the UE, the SRNC 20 starts exchanging data with the CN 30 and the DRNC 10, and then ends the procedure after the data exchange.

[0051] FIG. 5 illustrates a procedure for transmitting information required for allocating a common channel from the DRNC to the SRNC according to another embodiment of the present invention. Referring to FIG. 5, in step 501, the DRNC 10 receives an RNSAP signaling message, i.e., the Common Transport Channel Resources Request message, from the SRNC 20. The DRNC 10 detects service parameters and the type of the common channel from the received Common Transport Channel Resources Request message.

[0052] In step 502, the DRNC 10 determines whether the type of the common channel included in the Common Transport Channel Resources Request message is an RACH, given that the common channel allocated to the UE is an uplink common channel. Thus, the DRNC 10 determines whether the type of the common channel allocated by the SRNC 20 is an RACH. As a result of the determination, if the type of the common channel is the RACH, the DRNC 10 proceeds to step 503. Otherwise, if the type of the common channel is not the RACH, but the CPCH, then the DRNC 10 proceeds to step 506. In addition, if the common channel to be allocated to the UE is a downlink common channel, the SRNC 20 is not required to separately determine the type of the common channel as shown in FIGs. 2 and 3, because the downlink common channel includes only the FACH.

[0053] In step 503, the DRNC 10 determines a PRACH based on the detected service parameters. Here, the DRNC 10 determines a PRACH among PRACHs defined in the DRNC 10 based on the service parameters detected from the RAB parameter message. Further, the DRNC 10 determines a PRACH for the UE considering a state of the PRACHs currently in use.

[0054] Next, in step 504, the DRNC 10 transmits information on the determined PRACH and its associated RACH to the SRNC 20 along with an RNSAP Response message, i.e., the Common Transport Channel Resources Response message. In step 505, the DRNC 10 starts exchanging data with the UE and the SRNC 20, and then ends the procedure after the data exchange.

[0055] Meanwhile, if it is determined in step 502 that the type of the common channel is not the RACH, the DRNC 10 determines a CPCH set based on the detected service parameters in step 506. Here, the DRNC 10 determines a preferred CPCH set among CPCH sets defined in the DRNC 10, based on the detected service parameters. Alternatively, the DRNC 10 can also select a CPCH set to be allocated to the UE considering a state of the CPCH sets currently in use. Since the CPCH sets have different characteristics, the DRNC 10 can determine a preferred CPCH set considering the detected service parameters such as the maximum bit rate.

[0056] In step 507, the DRNC 10 transmits information on the determined CPCH set and the determined CPCH set's ID to the SRNC 20 along with an RNSAP Response signaling message, i.e., the Common Transport Channel Resources Response message. In step 508, the DRNC 10 starts receiving a CPCH from the UE and transmitting the received CPCH to the SRNC 20, and then ends the procedure after the data transmission.

[0057] Next, a detailed description will be made of a method for selecting the CPCH among the common channels and then allocating the selected CPCH. In general, as for the CPCH, a plurality of CPCH sets are included in the DRNC, and the DRNC allocates different CPCH sets according to the services. In this case, in order to determine a proper CPCH set for a specific UE, the DRNC should be provided with information on the service requested or received by the UE from the SRNC. Shown in Table 3 is information on the CPCH sets included in the DRNC.

Table 3

CPCH Set	Minimum SF	Num of PCPCH	TTI	Channel Coding	Num of Signatures
CPCH Set 1	SF4	4	10ms	1/3 turbo coding	8
CPCH Set 2	SF8	8	10ms	1/3 turbo coding	8
CPCH Set 3	SF8	16	20ms	1/2 convolution coding	16
CPCH Set 4	SF16	32	20ms	1/2 convolution coding	16

[0058] Referring to Table 3, the DRNC has 4 CPCH sets included in its cell, and the CPCH sets have different information on the minimum SF value, the number of physical common packet channels (PCPCHs), the TTI value of transport format set information, and the number of signatures available for the CPCPH set. As a result, the UEs allocated different CPCH sets are provided with the services having different bit rates.

[0059] The DRNC uses the maximum bit rate included in the RNSAP signaling message received from the SRNC

in order to allocate a specific CPCH set to a specific UE among the CPCH sets allocated to the DRNC itself. Upon receiving the maximum bit rate, the DRNC selects a CPCH set capable of supporting the received maximum bit rate among the CPCH sets currently included in the DRNC, and transmits information on the selected CPCH set to the SRNC.

[0060] Shown in Table 4 are bit rates available for the respective SF values.

Table 4

SF	Channel Bit Rate	Data Bit Rate (1/2 coding)	Data Bit Rate (1/3 coding)
4	960Kbps	480Kbps	320Kbps
8	480Kbps	240Kbps	160Kbps
16	240Kbps	120Kbps	80Kbps
32	120Kbps	60Kbps	40Kbps
64	60Kbps	30Kbps	20Kbps
128	30Kbps	15Kbps	10Kbps
256	15Kbps	7.5Kbps	5Kbps
...	...	...	...

[0061] Table 4 shows the bit rates available for the respective SF values according to the coding rates. For example, if SF=4, the original channel bit rate is 960Kbps and the bit rate is 480Kbps for 1/2 coding and 320Kbps for 1/3 coding.

[0062] Next, shown in Table 5 are maximum bit rates and associated CPCH sets available for (or allocable to) the corresponding maximum bit rates.

Table 5

Max Bit Rate	Min SF with 1/2 coding	Min SF with 1/3 coding	Available CPCH sets
5.15Kbps	256	128	CPCH set 1, 2, 3, 4
12.2Kbps	128	64	CPCH set 1, 2, 3, 4
14.4Kbps	64	64	CPCH set 1, 2, 3, 4
28.8Kbps	64 or 32	32	CPCH set 1, 2, 3, 4
57.6Kbps	32 or 16	32	CPCH set 1, 2, 3, 4
32Kbps	32	32	CPCH set 1, 2, 3, 4
64Kbps	16	32	CPCH set 1, 2, 3, 4
128Kbps	8	8	CPCH set 1, 2, 3
384Kbps	4	4	CPCH set 1
...	...	...	...

[0063] Table 5 shows relationships between the maximum bit rates and associated CPCH sets available for the maximum bit rates, based on Tables 3 and 4. For example, the CPCH set 4 is larger than the CPCH set 3, the CPCH set 3 is larger than the CPCH set 2, and the CPCH set 2 is larger than the CPCH set 1 in the number of available CPCHs. Therefore, when the CPCH sets can be simultaneously allocated, it is possible to set an allocation probability of the CPCH set 2 to be higher than that of the CPCH set 1, an allocation probability of the CPCH set 3 to be higher than that of the CPCH set 2, and an allocation probability of the CPCH set 4 to be higher than that of the CPCH set 3. That is, in FIG. 5, it is preferable to allocate the CPCH set 3 to the UE with the maximum bit rate of 128Kbps. In addition, it is preferable to allocate the CPCH set 4 to the UE with the maximum bit rate of 64Kbps.

[0064] If the SRNC designates a service parameter for a specific UE among the service parameters included in the RAB parameter message received from the CN as the maximum bit rate in an RNSAP signaling message for common channel allocation and transmits the RNSAP signaling message to the DRNC, then the DRNC determines a CPCH set proper for the maximum bit rate parameter in the RNSAP signaling message among the CPCH sets previously

included in the DRNC, and then transmits information on the determined CPCH set to the SRNC. Here, a CPCH set ID can be used for the information on the determined CPCH set. The SRNC transmits the received CPCH set ID to the UE using an RRC message.

[0065] The UE then recognizes information on the CPCH set through system information received over a broadcast channel (BCH) from the corresponding cell, and then initiates transmission of the CPCH signal using the received CPCH set information.

[0066] Further, the DRNC can transmit the whole information on the CPCH set to the SRNC along with a CPCH set ID for the determined CPCH. In this case, the SRNC can receive the whole information on the CPCH set for the UE through an RRC message. Therefore, the UE can recognize information on the CPCH set even without receiving the BCH information. Specifically, when a UE transitions from a CELL_DCH state to a CELL_FACH state, the UE can receive information on the common channel to be used in the CELL_FACH state, directly through RRC message not through the BCH. That is, when the SRNC has the service parameters for the UE and the UE performs a handover in a "connected mode" where the UE is connected to a common radio resource, the UE can receive information on the common channel directly through the RRC message and construct the common channel.

[0067] In addition, when the DRNC transmits only specific information of the information on the CPCH set to the SRNC along with the CPCH set ID, the SRNC transmits the information on the CPCH set, received from the DRNC, to the UE through the RRC message, and the UE constructs a CPCH by preferentially applying the received information to overlapped information of the CPCH set information received over the BCH. For example, if the number of signatures available for a specific CPCH set is 16, the DRNC can allow the UE to use some of the 16 available signatures. The DRNC may provide the SRNC with information indicating that only 8 signatures are available for the UE, and upon receiving this information from the SRNC, the UE can access the CPCH set using only the allowed signatures. In this case, the DRNC can control the UE's right to use the CPCH set considering the current state of the cell.

[0068] The method for transmitting the CPCH set-related information can be equally applied even to the RACH and the FACH. The CPCH set can also be equally applied to the PRACH and the FACH, so the present invention is not restrictive to the CPCH, but can be applied to all of the common channels.

[0069] As described above, to select a common channel, the SRNC transmits information stored therein to the DRNC so that the DRNC may determine a proper common channel for the UE, thus increasing utilization efficiency of the common channel and providing various services. In particular, the CPCHs are given different characteristics according to CPCH sets, and then, the DRNC sets an effective CPCH set according to service requests from the UE, thus providing a high-quality service.

[0070] While the invention has been shown and described with reference to a certain preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

Claims

1. A method for setting a common channel for a packet data service by an SRNC (Serving Radio Network Controller) to a UE (User Equipment) through a Node B and a DRNC (Drift Radio Network Controller) when the UE is handed over from a first Node B to a second Node B as the UE moves to the second Node B, in a mobile communication system including the UE, the first Node B providing the packet data service to the UE, the SRNC connected to the first Node B, a CN (Core Network) connected to the SRNC, and the DRNC connected the second Node B neighboring the first Node B and also connected to the SRNC, wherein the CN has bit rate information for the packet data service and transmits the bit rate information to the SRNC, and the SRNC stores the bit rate information, the method comprising the steps of:

   transmitting service parameters including the bit rate information for the packet data service to the DRNC;
   receiving information on a common channel determined based on the service parameters from the DRNC; and
   transmitting information on the determined common channel to the UE through the DRNC and the second Node B, to allocate the determined common channel to the UE.

2. The method as claimed in claim 1, wherein the bit rate information includes a maximum bit rate and a guaranteed bit rate.

3. The method as claimed in claim 1, wherein the common channel is one of a common packet channel (CPCH), a random access channel (RACH) and a forward access channel (FACH).

4. A method for setting a common channel for a packet data service by an SRNC (Serving Radio Network Controller)

to a UE (User Equipment) through a Node B and a DRNC (Drift Radio Network Controller) when the UE is handed over from a first Node B to a second Node B as the UE moves to the second Node B, in a mobile communication system including the UE, the first Node B providing the packet data service to the UE, the SRNC connected to the first Node B, a CN (Core Network) connected to the SRNC, and the DRNC connected the second Node B neighboring the first Node B and also connected to the SRNC, wherein the CN has bit rate information for the packet data service and transmits the bit rate information to the SRNC, and the SRNC stores the bit rate information, the method comprising the steps of:

transmitting service parameters including bit rate information for the packet data service to the DRNC using an RNSAP (Radio Network Subsystem Application Part) message;
receiving information on a common channel determined based on the service parameters through an RNSAP response message from the DRNC; and
transmitting the determined common channel information to the UE through a radio resource control message, to allocate the determined common channel to the UE.

5. The method as claimed in claim 4, wherein the RNSAP message includes a common transport channel resources request message.

6. The method as claimed in claim 4, wherein the RNSAP response message includes a common transport channel resources response message.

7. The method as claimed in claim 4, wherein the bit rate information includes a maximum bit rate and a guaranteed bit rate.

8. The method as claimed in claim 4, wherein the common channel is one of a common packet channel (CPCH), a random access channel (RACH), and a forward access channel (FACH).

9. A method for setting a common channel for a packet data service by an SRNC (Serving Radio Network Controller) to a UE (User Equipment) through a Node B and a DRNC (Drift Radio Network Controller) when the UE is handed over from a first Node B to a second Node B as the UE moves to the second Node B, in a mobile communication system including the UE, the first Node B providing the packet data service to the UE, the SRNC connected to the first Node B, a CN (Core Network) connected to the SRNC, and the DRNC connected the second Node B neighboring the first Node B and also connected to the SRNC, wherein the CN has bit rate information for the packet data service and transmits the bit rate information to the SRNC, and the SRNC stores the bit rate information, the method comprising the steps of:

determining service parameters including the bit rate information for the packet data service, determining a type of a common channel for transmitting packet data according to the determined service parameters, and then transmitting the determined service parameters and the determined common channel type to the DRNC;
receiving information on the common channel determined based on the service parameters and the common channel type from the DRNC; and
transmitting the received common channel information to the UE through the DRNC and the second Node B, to allocate the determined common channel to the UE.

10. The method as claimed in claim 9, wherein the bit rate information includes a maximum bit rate and a guaranteed bit rate.

11. The method as claimed in claim 9, further comprising the steps of:

upon receiving the service parameters and the common channel type from the SRNC, determining by the DRNC whether the received common channel type represents a random access channel (RACH);
determining a physical random access channel (PRACH) based on the service parameters, when the common channel type represents the random access channel; and
transmitting information on the determined physical random access channel and the determined random access channel as the common channel information to the SRNC.

12. The method as claimed in claim 9, further comprising the steps of:

determining by the DRNC a common packet channel (CPCH) set according to the service parameters, when the common channel type represents a common packet channel; and
transmitting information on the determined CPCH set and an ID (Identification) of the determined CPCH set as the common channel information to the SRNC.

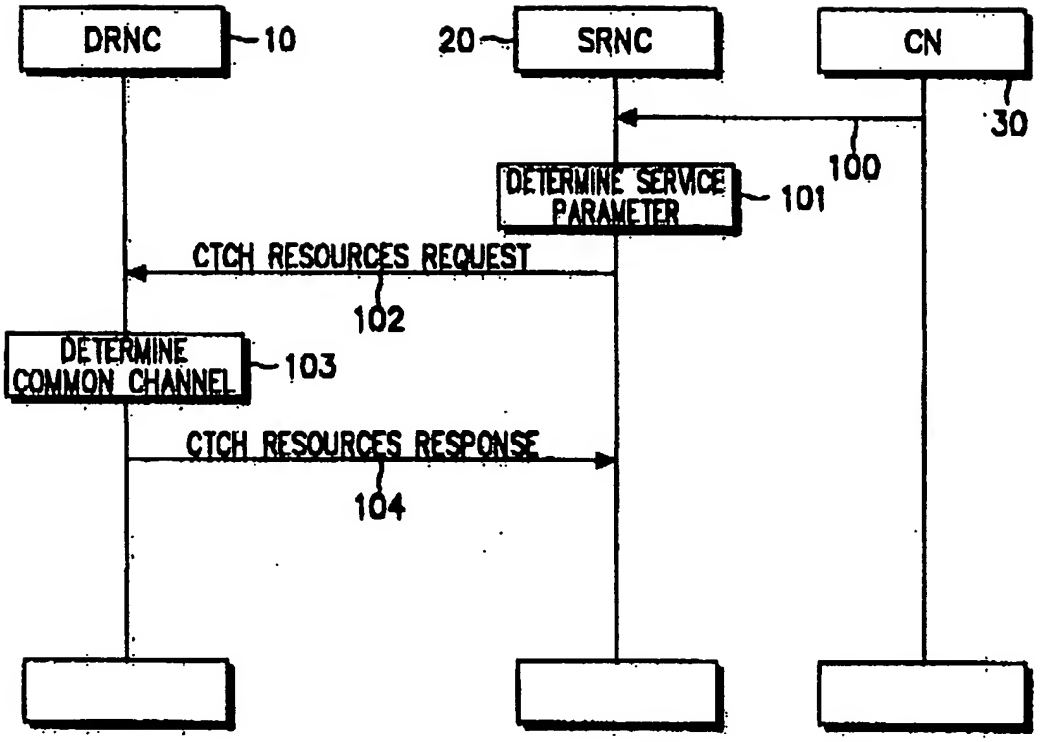
DRNC
10
20
SRNC
CN
30
100
DETERMINE SERVICE PARAMETER
101
CTCH RESOURCES REQUEST
102
DETERMINE COMMON CHANNEL
103
CTCH RESOURCES RESPONSE
104

FIG. 1

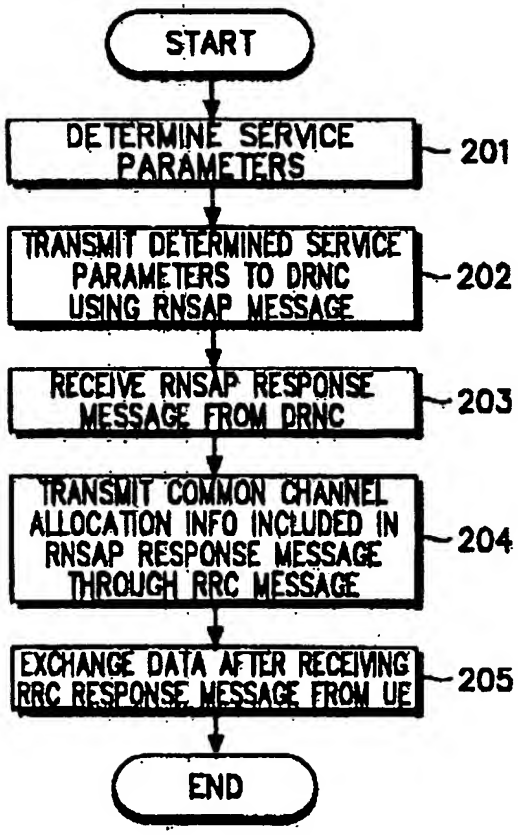
START
DETERMINE SERVICE PARAMETERS
201
TRANSMIT DETERMINED SERVICE PARAMETERS TO DRNC USING RNSAP MESSAGE
202
RECEIVE RNSAP RESPONSE MESSAGE FROM DRNC
203
TRANSMIT COMMON CHANNEL ALLOCATION INFO INCLUDED IN RNSAP RESPONSE MESSAGE THROUGH RRC MESSAGE
204
EXCHANGE DATA AFTER RECEIVING RRC RESPONSE MESSAGE FROM UE
205
END

FIG. 2

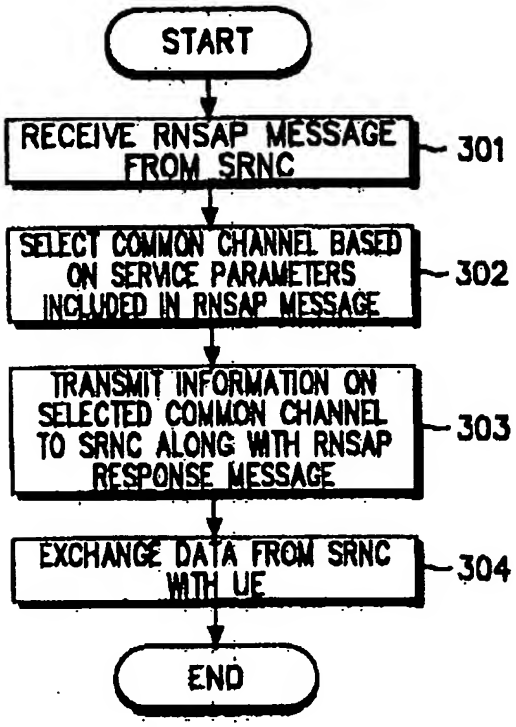
START
RECEIVE RNSAP MESSAGE FROM SRNC
301
SELECT COMMON CHANNEL BASED ON SERVICE PARAMETERS INCLUDED IN RNSAP MESSAGE
302
TRANSMIT INFORMATION ON SELECTED COMMON CHANNEL TO SRNC ALONG WITH RNSAP RESPONSE MESSAGE
303
EXCHANGE DATA FROM SRNC WITH UE
304
END

FIG. 3

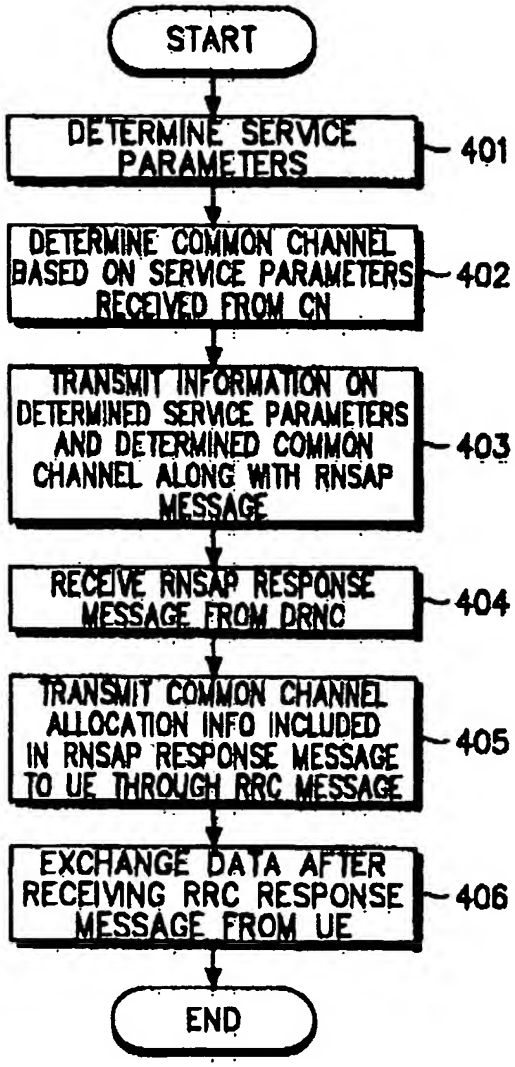
START
DETERMINE SERVICE PARAMETERS
401
DETERMINE COMMON CHANNEL BASED ON SERVICE PARAMETERS RECEIVED FROM CN
402
TRANSMIT INFORMATION ON DETERMINED SERVICE PARAMETERS AND DETERMINED COMMON CHANNEL ALONG WITH RNSAP MESSAGE
403
RECEIVE RNSAP RESPONSE MESSAGE FROM DRNC
404
TRANSMIT COMMON CHANNEL ALLOCATION INFO INCLUDED IN RNSAP RESPONSE MESSAGE TO UE THROUGH RRC MESSAGE
405
EXCHANGE DATA AFTER RECEIVING RRC RESPONSE MESSAGE FROM UE
406
END

FIG. 4

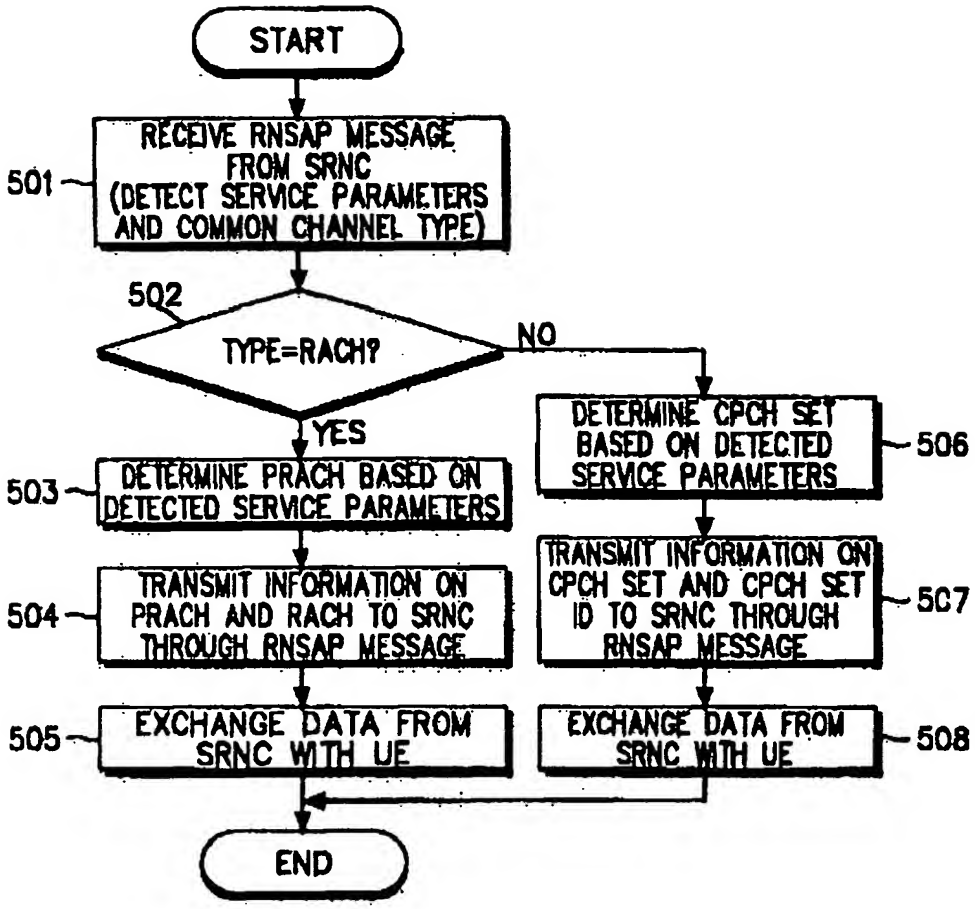
START
RECEIVE RNSAP MESSAGE FROM SRNC (DETECT SERVICE PARAMETERS AND COMMON CHANNEL TYPE)
501
502
TYPE=RACH?
NO
YES
DETERMINE PRACH BASED ON DETECTED SERVICE PARAMETERS
503
TRANSMIT INFORMATION ON PRACH AND RACH TO SRNC THROUGH RNSAP MESSAGE
504
EXCHANGE DATA FROM SRNC WITH UE
505
DETERMINE CPCH SET BASED ON DETECTED SERVICE PARAMETERS
506
TRANSMIT INFORMATION ON CPCH SET AND CPCH SET ID TO SRNC THROUGH RNSAP MESSAGE
507
EXCHANGE DATA FROM SRNC WITH UE
508
END

FIG. 5

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